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Annual report

Columbus Horticultural Society, Columbus, Ohio

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ANNUAL REPORT

OF THE

COLUMBUS HORTICULTURAL SOCIETY

For the year ending December 31, 1896,

CONTAINING

CONSTITUTION, LIST OF MEMBERS, AND
QUARTERLY JOURNAL.

PREPARED BY
J. S. HINE, SECRETARY.
O. S. U.

COLUMBUS, OHIO, 1897:
PUBLISHED BY THE SOCIETY.

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COLUMBUS HORTICULTURAL SOCIETY.

1896.

OFFICERS.

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H. M. SESSIONS,	*First Vice-President*
*R. J. TUSSING,	*Vice-President*
JAS. S. HINE,	*Secretary*
GEORGE W. SINKS,	*Treasurer*

Executive Committee.

D. S. KELLICOTT, O. W. ALDRICH, J. J. JANNEY.

Chairmen of Standing Committees.

Botany,	E. M. WILCOX
Vegetable Pathology,	W. A. KELLERMAN
Entomology,	D. S. KELLICOTT
Meteorology,	WILLIAM R. LAZENBY
Library,	J. J. JANNEY
Fruits,	O. W. ALDRICH
Plants and Flowers,	J. H. LAGEMAN
Vegetables,	H. W. PHELPS

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GEO. F. BAREIS,	*Vice-President*
B. F. GAYMAN,	*Secretary-Treasurer*
E. S. TUSSING, MRS. GEO. F. BAREIS, JNO. F. BACHMAN,	*Executive Committee*

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* Ex-officio: President Winchester Section.

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William G. Deshler,
Alexander Houston,
G. S. Innis,
J. J. Janney,
J. K. Jones,
Mrs. J. H. Klippart,
C. J. Hardy,
Mrs. N. E. Lovejoy,
John M. Pugh,
George W. Sinks,

of Columbus.

W. J. Green, ... Wooster, O.
W. S. Devol, ... Tucson, Ara.

MEMBERS.

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Mrs. Joseph Bradford,
Mrs. J. H. Brenneman,
Mrs. Henry C. Bruenning,
D. C. Burson,
C. W. Critchfield,
Mrs. Cathcart,
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Miss Freda Detmers,
Geo. W. Gill,
John L. Gordon, Jr.,
E. C. Green,
J. S. Hine,
Thomas F. Hunt,
D. S. Kellicott,
W. A. Kellerman,
Albert Knopf,
J. H. Lageman,
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Edward Orton,
Charles Parrott,
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Horace M. Sessions,
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U. G. Swingle,
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E. M. Wilcox.

of Columbus.

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F. W. Barr, ... Brice, O.

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†Geo. Barnhart,
†Geo. F. Bareis and Wife,
†Charles Bruns,
†L. W. Beery and Wife,
†Daniel Detwiler and Wife,
†T. M. Fouts and Wife,
†Philip Game and Wife,
†B. F. Gayman and Wife,
†Miss Eliza Gayman,
†Isaac Lehman and Wife,
†E. A. Peters and Wife,
†B. F. Showalter and Wife,
†I. E. Stevenson and Wife,
†R. J. Tussing and Wife,
†E. S. Tussing and Wife,

of Canal Winchester, O.

---

*Deceased.
†Members of Winchester Section.

MEMBERS—Continued.

Moses Craig,	Corvalis, Ore.
M. Crawford,	Cuyahoga Falls, O.
Nelson Cox,	Ensee, O.

Frank Clotts,
John D. Ross,
of Gahanna, O.

C. L. Dickey,
W. R. Parsons,
Mrs. J. M. Wetmore,
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Stephen Cook,
F. P. Dill,
J. W. Everal,
John Haywood,
*A. B. Kohr,
L. H. McFadden,
H. Warren Phelps,
T. A. Scott,
C. E. Sharp and Wife,
Jas. Best and Wife,
of Westerville, O.

L. M. Blomfield,
Aug. D. Selby,
Charles E. Thorne,
F. M. Webster,
of Wooster, O.

Mary Cheney,
Mary Ferran,
Mary Jenny,
Mrs. E. Thomas,
J. Wetherall,
of Camp Chase, O.

F. P. Stump,	Convoy, O.
†C. R. Elsea and Wife,	Lithopolis, O.
E. E. Bogue,	Stillwater, Okla.
James T. Miller,	Marble Cliff, O.
Wm. Miller,	Gypsum, O.
Mrs. Emmet Mix,	Avenue, O.
Mrs. T. O. Phinney,	Clintonville, O.
F. Riebel,	Galloway, O.
J. N. Riley,	Washington C. H., O.
Welton Seymour,	Groveport, O.
Clarence M. Weed,	Durham, N. H.
Wm. C. Werner,	Painesville, O.
C. K. Wilson,	Springfield, O.

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George W. Campbell,	Delaware, O.
B. W. Carlisle,	Lancaster, O.
J. A. Fetters,	Lancaster, O.
J. J. Harrison,	Painesville, O.
George M. High,	Middle Bass, O.
W. H. Latham,	Indianapolis, Ind.
A. W. Livingston,	Columbus, O.
William McKeller,	Lancaster, O.
N. Ohmer,	Dayton, O.
S. B. Porter,	Columbus, O.
W. B. Stover,	Akron, O

CONSTITUTION.*

NAME AND OBJECT.

SECTION 1. This Society shall be known as the COLUMBUS HORTICULTURAL SOCIETY.

SEC. 2. The object for which it is organized is the advancement of horticultural knowledge.

MEMBERSHIP.

SEC. 3. Any person may become a member of the Society by the payment of one dollar. Wives and daughters of members shall be members without the payment of any fee. Male members shall pay an annual fee of fifty cents, in advance, which shall be for the year ending with the next succeeding annual meeting; and no member shall have the right to vote, or other privilege of membership of the Society, so long as such annual fee shall remain unpaid. Any lady resident in Franklin County may become a member without any fee.

SEC. 4. Any person may become a life member of the Society upon payment of ten (10) dollars, which shall be in lieu of all assessments or annual dues; and all persons who have been members for twenty or more years, and have paid their regular dues, shall be life members.

SEC. 5. Any person distinguished in horticulture, upon the recommendation of the Executive Committee, may be elected an honorary member of the Society by the affirmative vote of two-thirds of the members present at any regular meeting. Honorary members shall not have the right to vote nor incur any of the liabilities of members, but they shall be admitted to all meetings and exhibitions of the society.

OFFICERS.

SEC. 6. The officers of the Society shall be a President, a First Vice-President, as many Vice-Presidents as there may be local sections of the Society, a Secretary, a Treasurer, and an Executive Committee of three members, all of whom, except the Vice-Presidents *ex-officio*, shall be elected by ballot at the regular meeting in December, and shall serve until their successors are elected. The President of each section shall be *ex-officio* Vice-President of this Society.

SEC. 7. The President, or, in his absence, the Vice-President, shall preside at all meetings of the Society and of the Executive Committee. In the absence of both, a President *pro tem.* shall be appointed.

SEC. 8. The Secretary shall keep a record of the proceedings of the Society, and attend to all necessary correspondence. He shall also receive all moneys due the Society for membership, annual fees and assessments, and pay over the same to the Treasurer; and shall receive as a remuneration for his services the sum of fifty (50) dollars per year.

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*As Amended January 24th, 1894.

SEC. 9. The Treasurer shall receive from the Secretary all money and funds belonging to the Society, and shall be the custodian of all bonds, stocks and securities belonging to the Society, and shall pay out and transfer the same only on the order of the Society, certified by the President and Secretary; and he shall keep an account of the receipts and disbursements, and report it to the annual meeting; and shall give such bonds as the Executive Committee may require.

SEC. 10. The Executive Committee shall have control of all exhibitions, and have a general supervision of all matters pertaining to the welfare of the Society. It shall have power to call special meetings whenever, in its judgment, it shall be necessary.

SEC. 11. The chairmen of the standing committees shall be elected at the annual meeting, and such chairmen shall have the power to appoint the other members of their respective committees.

SEC. 12. The following standing committees shall be elected:

1. On Botany.
2. On Vegetable Pathology.
3. On Entomology.
4. On Meteorology.
5. On Library.
6. On Fruits.
7. On Plants and Flowers.
8. On Vegetables.

INVESTMENTS.

SEC. 13. The Executive Committee shall make and manage all investments. No investment shall ever be changed without the recommendation of said committee, approved by two-thirds each of the members and life members of the Society; nor shall the present invested fund of the Society ever be reduced in amount; but if it should become so by any unavoidable cause, the income shall be invested until the full amount is restored.

SEC. 14. The funds of the Society shall be invested either in the bonds of the United States, the State of Ohio, the City of Columbus, or Franklin County, Ohio; or in loans not exceeding the legal rate of interest in the State of Ohio, payable semi-annually or annually, and secured by first mortgage on unincumbered real estate, situated in Franklin County, Ohio, of the value of twice the amount of the sums loaned thereon, exclusive of buildings and improvements.

LOCAL SECTIONS.

SEC. 15. Whenever a local membership of ten or more members of the Society, in good standing, residing at or near any point in Franklin County shall make application to the Society it may grant to said members permission to organize a Section to further the objects of the Society; said Section be authorized to hold meetings, elect officers, recommend persons for membership in the Society, and to originate and recommend such measures as shall be deemed proper, but the meetings of the Section shall occur on some other day than that of the regular meeting of the Society.

SEC. 16. All annual fees of members affiliating with any Section and 50 per cent. of the membership fees of those recommended by the Section shall be reserved by it, the money thus accruing to be expended in such manner, consistent with the object of the organization, as it may direct.

SEC. 17. All members affiliating with any Section and paying annual dues to the same shall be entitled to the JOURNAL of the Society.

SEC. 18. Each Section shall choose its own officers, of such number as it may determine, including a President, who shall become one of the Vice-Presidents of the Society, and a Secretary-Treasurer, who shall communicate to the Secretary of the Society on or before the annual meeting of each year a report of the condition of the Section for that year, and directly following the meeting in March, June, September and December a quarterly abstract of the proceedings for publication in the JOURNAL, the form and extent of such reports to be under the direction of the Secretary of the Society.

AMENDMENTS.

SEC. 19. This Constitution may be amended at any regular meeting of the Society: Provided, such proposed amendment shall have been submitted, in writing, at least, one week before such meeting.

BY-LAWS.

ORDER OF BUSINESS.

SECTION 1. The following shall be the order of business at every meeting, unless changed at the time by the vote of the meeting:

1. Reading the minutes of the preceding meeting.
2. Unfinished business.
3. Election of members.
4. Reports of special committees.
5. Reports of standing committees.
6. Communications and correspondence.
7. Regular paper or address and discussion.
8. Miscellaneous business.
9. Adjournment.

TIME OF MEETING.

SEC. 2. Regular meetings shall be held on the last Saturday of each month, at 2:30 p. m.

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T. F. Hunt.

Vol. XI. MARCH, 1896. No. 1.

Columbus Horticultural Society

Quarterly Journal of Proceedings

Edited by J. S. HINE, Secretary.

PUBLISHED BY THE SOCIETY:
COLUMBUS, OHIO.

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UNIV. OF CALIFORNIA

Columbus Horticultural Society.

QUARTERLY JOURNAL OF PROCEEDINGS.

VOL. XI. COLUMBUS, OHIO, MARCH, 1896. No. 1.

PROCEEDINGS OF THE SOCIETY.

JANUARY.

The Society met in Horticultural Building January 25, 1896.

Professor Wm. R. Lazenby, the newly elected President, presided.

L. M. Bloomfield and J. J. Janney were chosen as a committee to audit the Treasurer's accounts.

J. H. Lageman gave a short report on plants and flowers.

Prof. D. S. Kellicott called attention to the fact that *Insect Life* is no longer published. But in its stead the Department of Agrlculture has begun the publication of bulletins of economic importance. Number one has appeared and gives an exhaustive treatise of the honey bee. The work is very commendable and should be in the library of every working entomologist.

The Secretary read a short report on Entomolony from Prof. F. M. Webster of the Experiment Station. This report may be read on another page.

Professor Wm. R. Lazenby referred to January as one of the warmest for years. It has been characterized by high temperature and cloudy weather.

Communications were read from Professors Devol and Alwood and from Wm. C. Werner.

The Presidents address was a very pleasant production. Professor Lazenby gave a short historical sketch of the Society and made many suggestions that we are eager to realize in the near future.

Professor Kellicott heartily commended the address referred to above, and said that he hoped the members could give some strictly scientific papers from time to time. He urged that papers presented, be accompanied by specimens for illustration.

Mr. H. M. Sessions' paper on "My Garden on a City Lot," was listened to with great interest and brought forth an extended discussion.

In answer to a question regarding the value of prickley comfrey, Professor Hunt stated that it is a luxurient grower, but does not contain as much dry matter as corn. Stock will not eat it while it is growing, and have to be learned to eat it in the dry state.

Professor Lazenby said his experience with the plant has led him to agree with what Professor Hunt has stated.

Maples for shade trees was next discussed.

Professor Kellerman recommended the hard maple. He said it was a slow grower but is preferable in many respects to the soft maple. Something is gained by planting twice as many trees as is desired on a certain area—one-half hard and the other half soft maples. The soft variety grows rapidly and furnishes excellent shade in a few years. At the expiration of fifteen or twenty years these last may be cut away and the whole space given to the hard maples.

The Society then adjourned.

FEBRUARY.

The meeting was called to order by the President, Professor Wm. R. Lazenby.

The name of C. K. Wilson was proposed for membership. He was unanimously elected.

The committee appointed at the last meeting to audit the Treasurer's accounts reported that they had performed their duty and found everything exactly correct.

E. E. Bogue reported that work on the lichens of the State was progressing. The list now includes over two hundred species. Mr. Bogue said that trees in the city, under the influence of coal smoke, are nearly free from lichens, but in native forests often as many as twenty species may be taken from a single tree.

The Secretary presented samples of the work of the fruit bark beetle, together with the insect in its various stages.

E. E. Bogue read a short report on scale insects.

Professor Lazenby said that the 20th was the coldest day of the month. The thermometer falling to –3° on that date. The maximum temperature of 65° was recorded on the 28th. The rainfall amounted to 1.44 inches—about one-half of the normal for February.

Mr. Janney reported that he thought the books that H. C. Noble promised the Society would soon be forthcoming.

Professor Lazenby exhibited samples of lettuce and Dutch hyacinths.

A question was raised regarding the value of sawdust as a fertilizer. Messrs. Hunt, Janney and Sessions considered it of no great consequence.

The regular program was as follows:

"The History of the Peach," J. J. Janney.

"A Problem in Intensive Agriculture," Prof. T. F. Hunt.

K. A. Orvis was present and exhibited a specimen of his fine seedling peach in alcohol.

The Society then adjourned.

MARCH.

The meeting was called to order by President Lazenby.

Under the head of communications and correspondence the Secretary read a short letter from the Secretary of the American Pomological Society, in which was expressed a desire to hold a meeting of that Society in Columbus in the near future. Also a letter from Nelson Cox. He made a statement regarding the "large crop of apples of '95." He stated that he shipped to different points. One car load was sent to London, England, and the results were so satisfactory, that he thinks of making that one of his markets hereafter. Mr. Cox reported that some of the peach buds were killed last February, but thinks that there will be a full crop of that fruit the coming season.

Professor Lazenby gave a short report on Meteorology. The warmest day of March was the 26th, when the thermometer went up to 56°. The 13th was the coldest, the minimum registered on that date being 5°. Last year the coldest for March was 16°. The total rainfall for the month was 2.38 inches. This fell on sixteen different days. The greatest rainfall happened on the 19th, when the precipitation was .9 inch.

R. J. Tussing gave a short report on vegetables. He stated his success in raising lettuce. He said that the prospect for strawberries is very unpromising. The roots are short and mostly on top of the ground. Raspberries did not pass the winter well.

Professor Lazenby exhibited specimens of mushrooms from the department greenhouse. He stated that although the specimens that have appeared are large, the prospect for a good yield is not promising.

The regular program was as follows :

" Plants about a City Home," Professor Kellerman.

" Favorite Flowers," J. H. Lageman.

C. K. Wilson gave interesting notes on hanging baskets. These notes are published in full in this number.

E. C. Green showed a sample of his Simplicity Plant Waterer.

Bills to the amount of $9.30 were presented by the Secretary. These were ordered paid by the Society.

The meeting was then declared adjourned.

JAS. S. HINE, *Secretary.*

REPORT ON ENTOMOLOGY.

REMARKABLE EXTENSION IN THE NORTHWARD RANGE OF THE BAG OR BASKET WORM, *Thyriodopteryx ephemeræformias.*

BY PROF. F. M. WEBSTER.

Some time ago I was rather surprised to receive the winter cocoons of this insect from Carthagenia, Mercer county, at least 25 miles north of the most northerly locality known for the species in Ohio, that of Georgesville, Franklin county, as reported by Prof. Kellicott. A few days ago I was still more surprised to receive a bag or basket within which the male had developed, and from which it had escaped probably last fall, from Grand Rapids, Wood county, a short distance south of Toledo. As near as I can calculate, this is in about lat. 40°30 ; almost, if not quite, the farthest north that it has ever been found. In both of the above mentioned cases it occurred on fruit trees, and in that of Grand Rapids it is possible that it might have been introduced on trees from the south. Whether or not it will be able to establish itself permanently, so far north, at such a distance from the Atlantic, and the influence of the gulf stream, remains to be seen.

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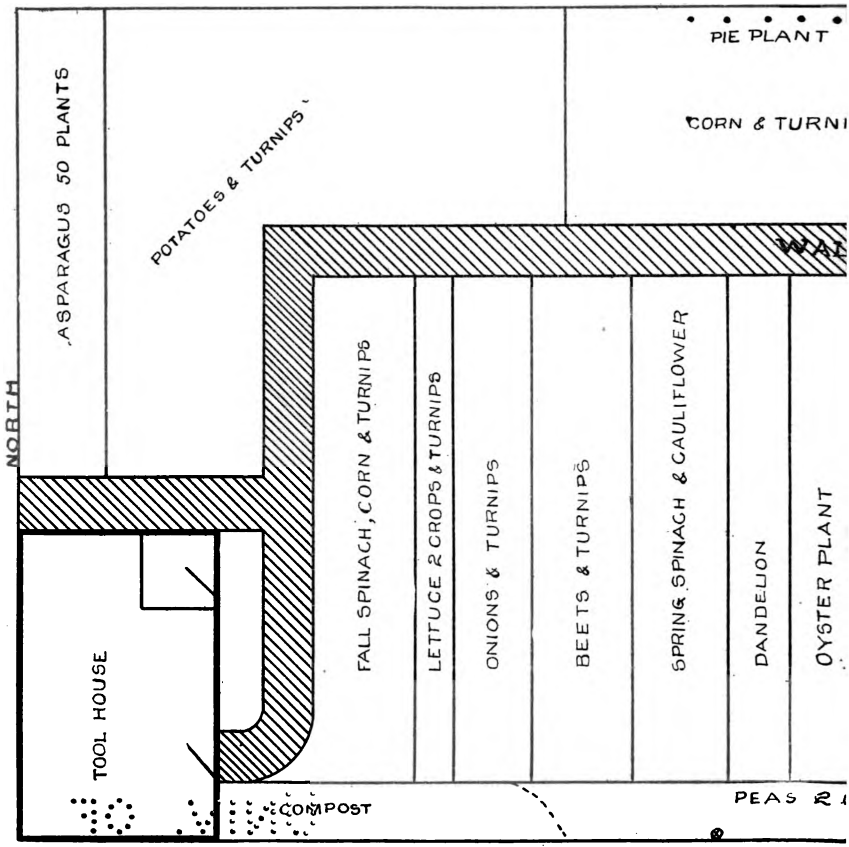
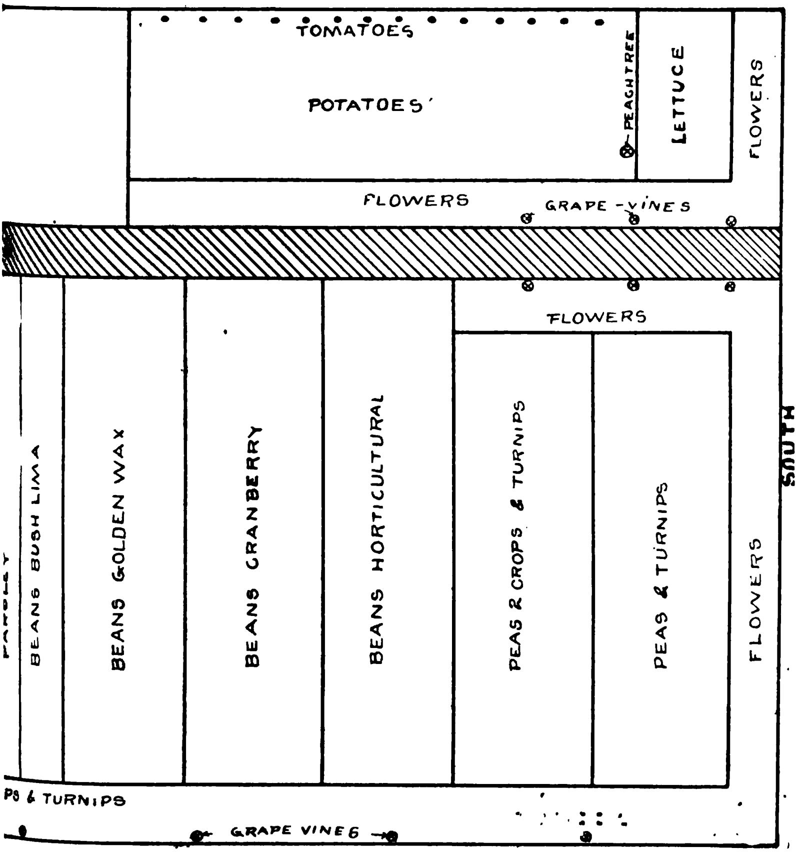


SESSIONS ON GARDENING ON A CITY LOT.



Kindly loaned the Society by A. W. Livington's Sons.

COMMUNICATIONS AND DISCUSSIONS.

GARDENING ON A CITY LOT.

BY H. M. SESSIONS.

The plat of ground on which I foolishly presumed (as I thought at the time) to plant a garden, was the back end of our house lot, No. 1256 Eastwood avenue, Columbus, O. The lot was thirty-five feet front, and 170 feet deep. The house and front yard occupied sixty-six feet; the clothes yard, a grass plot, back of the house, forty feet, which left sixty-four feet for a garden. This being thirty-five feet wide, made eight and one-half square rods of ground. A tool house and coal shed with space around it, a plank walk through the lot and a border for flowers occupied, at least, two and one-half square rods, leaving six square rods of ground for the garden. This end of the lot was filled three years ago to level it up, with two feet of pipe clay, of a yellowish-brown color, from the bottom of a cellar on Long street. It was certainly the most unpromising outlook for a garden one could imagine. This pipe clay was sticky as wax when wet, and hard as a road bed when dry; and formed such a crust after every rain that few germinating seeds could force their way through it, to the light of the sun. If the drought was long continued, the surface would crack in irregular shape, to the depth it had become dry.

The only time to work such soil was to jump at your chances, between the showers, which not being very frequent, the past season, the lack of moisture was supplied from the city water, through a sprinkler attached to a rubber hose. Fifty-two large wheel-barrow loads of horse manure from stables across the alley were spread on to the depth of three inches, and the land plowed deep in October. Twenty more loads were spread on the surface, among the large lumps, into which the soil was broken by the plow, and all left to freeze through the winter. The frost came out in March, when it was comparatively dry, and with a garden rake, it was thoroughly raked over.

It soon froze again, two or more inches deep, which was broken up with a pick into large lumps, and when thawed, it was again raked over. There having been no rain, it was fine and mellow as an onion bed, and in good condition to receive the seeds of hardy vegetables.

Peas, beets, lettuce, parsley, spinage, salsify, cauliflower, sunflower, dandelions and onion sets were planted early in April, and covered with black bottom land soil, which forms no crust, to hinder vegetation. There were planted, in the fall before, on the clothes yard grass plot, three pear trees, the Bartlett, Seckel and Clap's Favorite, and on the garden lot one Elberta peach, and ten grape vines to be trained on the fence, two varieties each of the Concord, Delaware, Niagara, Agawam and Worden; also four rhubarbs and fifty asparagus roots and a bed of spinage, four feet by twelve, sowed in drills ten inches apart.

The seeds and roots were bought at a well-known seed store, and none of them failed; also some special potato fertilizer and phosphate to apply in the hill. There were eighteen kinds of plants and vegetables raised, embracing thirty-seven varieties, as follows: Five of potatoes, three each of beans and lettuce, two each of peas, onions and tomatoes, and one each of the other varieties. Two crops were grown on most of the land, in one season, and three crops in several instances. The land with only one crop grown, was confined to parsley, dandelions, salsify and tomatoes. The twelve tomato plants set were trained on a trellis, the west side of a tight board fence six feet high. They grew to the top of the fence, occupied but little ground and produced abundantly. Turnips followed all crops harvested before the first of September, and were sown from July 24 to the first of September as the ground became vacant.

Many of the varieties were planted at different times, one or two weeks apart, so as to have a succession of crops to supply the table. For instance, spinach was planted in both the fall and spring; and by not cutting off the crown, two crops were cut from each planting. Three plantings of corn, three of beans, three of lettuce and five of peas were planted. Peas followed peas, in two cases; and lettuce followed lettuce, and turnips followed each. Turnips followed onions and potatoes. Corn followed fall spinach and then turnips after the corn. One row of cauliflower and two of beans followed spring spinach. The garden produced far beyond my expectations. The five varieties of potatoes were planted with a little potato fertilizer in the hill, on one rod of ground, and produced two bushels, or at the rate of 320 bushels per acre. Our family of six, and part of the time, seven grown persons, had more than we could use, and six other families near were the welcome recipients of the samples in abundance, until they declined to receive any more unless they could pay the market price, which they were allowed to do. The sales amounted to over five dollars, including 146 bunches of parsley and four bushels of spinich, which was sold to the markets at the wholesale prices. This last, the spinich, was sowed thick in drills and yielded in some parts of the bed one bushel to a square yard.

By the way, a neighbor's cow, as she was tethered on a vacant lot, nearly barren from the effects of the drought, received the benefit of the surplus corn fodder, beets and turnip tops, bean and pea vines and the refuse of all kinds of root and vegetable growth with a keen relish, and evident expressions of gratitude. She refused nothing except onion tops, which precaution prevented any bad flavor in her milk, though I presume she had no regard to an offensive breath. A neighbor's hens were also regaled in their confinement with scraps from the garden, especially did they relish the seeds from the sunflower that adorned the corners of the garden and grew, in one case, twelve feet high and produced fifty-two blossoms.

I was surprised at my own success. Many were the expressions of wonder by all who saw it, that so much could be grown on so small a piece of ground. Mr. Livingston, who made a special trip to see the garden in its prime, expressed his approval and admiration by saying that "there were more vegetables successfully growing on the same area of ground than he ever saw before." If every family would have a small garden it would help solve the problem of "how to live," as it was presented by Mr. Livingston in his valuable institute lecture on this same subject. The turnips produced abundantly. Those latest sown, though small, were pulled the last of December. On account of the late growing turnips the preparations for another year were delayed until after the turnips were pulled. Thirty-five wheelbarrow loads, or two or three inches of manure, was then spread on the garden, and since the freeze the whole lot has been broken up into lumps with a pick and left for the action of the frost through the winter.

Having noticed how few of the back yards of the many city homes are utilized for the production of vegetables for the table, I had no other motive in mind in writing this, my experience in gardening on a city lot, than to influence others to do the same, and thereby extend a small salary by providing many necessaries, and even luxuries for the family. It certainly is one way to help solve the problem of "how to live." If anyone is hereby induced to follow this example my object will have been accomplished.

COLORS AND THEIR RELATION TO ANIMAL LIFE.

BY F. M. WEBSTER.

This subject has not been selected with any special reference to my own ability to prepare an exhaustive work on animal coloration, as, to do this requires a naturalist that can in this age hardly exist, viz., one who is a specialist in every group of organisms. It appeared to me possible, however, that I might be able to bring before you some facts relating to the animal life existing everywhere about you, and which you either do not see, or seeing might not understand.

This field, the limit of which is indicated by my title, is an exceedingly interesting and fascinating one, and for those who love the poetic, and delight in giving the imagination its fullest sway, it will prove a veritable paradise; a land of roses, butterflies and the gaudiest of bubbles. For the exact investigator, it is wonderland thickly strewn with golden nuggets of truth, the value of which can hardly be over estimated, where pitfals and stumbling blocks are the rule and not the exception, yet must be sought for in the midst of a labyrinth of intricate, seductive paths whose ending is nowhere. In no other field biological research is more patient, pains taking study and observation required, and greater caution and discretion in forming conclusions based thereon demanded, than in this. A life long training is not too much preparation for a few years of labor here, and a pessimist, egotist or crank is very much out of place in this field of investigation.

I shall ask you to accompany me, as it were, to the tropical seas; to an island the coasts of which have been explored, while the interior we can only see at a distance and wonder what it might reveal to us if we were to explore its innermost fastness. I shall also ask you to mark the distinction between colors, the tints themselves, and coloration, the arrangement of these tints. Besides, we must leave wholly out of consideration all animals or plants that have at any time been under the vitiating influences of domestication. We must deal with nature pure and simple, and wherever that fickle dame chooses to lead us.

Mr. Beddard, in his work on animal coloration, tells us that the colors of animals are due either solely to the presence of definite pigments in the skin, or, in case of transparent animals to pigment in the tissues lying beneath the skin; or they are partly caused by optical effects due to the scattering, diffraction or unequal refraction of the light rays, being caused by the structure of the colored surfaces. By far the commonest source of color in invertebrate animals is the presence in the skin of definite pigments which absorb all the rays of light except those of a particular wave-length, thus giving the effect of a particular color. The same color, even in allied forms, is not always due to the presence of the same pigment, and sometimes differently colored animals have in reality the same skin pigments. Different colors maybe produced by a variation in the amount of pigment present.

Now, as stated by Mr. Alfred Russell Wallace, color seems to be a normal product of organization, entirely independent of utility. Sometimes, as in the different coloration on the breasts of woodpeckers, it seems to have no function whatever, as, in their natural haunts these birds do not show the spotted under surface. We can not, however, say that this coloration has ever been of use to these birds, and we do know that coloration of a particular kind is inherited and perpetuated where it seems to be absolutely dangerous. The trouble here is that we are not sure that we know all about the object thus seemingly endangered, and the missing facts might put an entirely different face on the matter.

This subject of animal coloration, especially where it includes protective mimicry, is at present causing a great deal of discussion among biologists, and it is because of this general attention, and the ease with which you may make observations of your own on subjects that daily present themselves to your eyes, that I take the liberty of presenting a rather difficult feature of a very difficult science. And I warn you in advance that whatever there is of truth in this matter will be found to be directly contrary to the idea of special creation, and supporting the not one whit the less divine method of creation; that by development and natural selection.

When we look upon the zebra or a giraffe, we marvel at the coloration of the one and the form and coloration of the other. Now, I am told on good authority that the zebra, in its native haunts, comes forth to feed in the dusk of evening, and at that time one may be so near one of these animals that he can distinctly hear its respiration, and yet on account of the blending of the white and dark stripes, giving it almost the exact hue of the ground, be absolutely unable to catch sight of it. The giraffe in its native jungle so closely represents a half dead tree with the top broken off and the shadows of the limbs and foliage of adjacent trees falling on its smooth bark, that it is no easy task to distinguish animal from tree, however ridiculous this statement may appear to those who have only observed these animals in zoological gardens and in the menagerie. Almost the same phenomenon as that offered by the zebra may be observed in our own gardens. We are familiar with the disgusting tomato worm, three or four inches long and half an inch in diameter—amply large enough to be readily seen, one would think—yet we have looked in vain for them where we had every evidence of their presence. The worm is green in color, like the plant, but both being nearly cylindrical a dark line is caused along the line of contact between plant and animal. But along each side of the worm are five short, oblique, white dashes, which so blend with the dark line as to still further protect the worm by rendering it impossible to readily see where the plant ends and the worm commences. I might here state that we have other worms, also the larva of moths, which, though smaller than this one, are yet quite large and conspicuous, especially if you were to lay them on your hand or a sheet of paper. But they cling to the edges of the leaves of trees while feeding, and in that position so nearly simulate a ragged, discolored and curled margin as to entirely conceal their identity.

Aside from the different coloration of the two sexes of birds, of which I shall have more to say farther on, many of our common birds are so colored as to offer them more or less protection from their enemies. The robin, as she moves about among the dead and discolored grass in spring in search of food, is not easily detected unless she chooses to hop about. The red on her breast so blends with the more somber color of other parts of her body that the observer sees only a tint almost exactly like that of her surroundings. On her nest, the red breast is concealed, while the only portion of her form exposed to view is of almost the exact color of the material of which her nest is composed. Looking directly down upon her from above, it is almost impossible to tell whether her nest is occupied or vacant. John Burroughs tells us how himself and a friend by accident found the nest of a bobolink and lost it again a minute afterwards; spent a half hour in trying to find it and failed; then felt the ground over with their hands and failed again. Mr. Burroughs returned again next day and beginning at a central point moved in slowly increasing circles, covering as he supposed nearly every inch of surface and exerting all of the vital power at his command, until his patience became exhausted and he gave up completely baffled. Finally, he watched the old birds return to feed their young, and keeping his eye on the exact spot, approached until he looked straight down upon it and began a close search among the grass. It was even then only after gazing long and intently that he was able to separate the nest and young which he had barely missed with his foot in his previous searching, from their surroundings, the yellowish brown, dry grass and stubble having the exact color of the half fledged young. A beautiful moth that I have taken occasionally, is, when at rest, almost the exact counterpart of a discolored leaf of the Evening Primrose, on which plant it is frequently found, while another is colored so nearly like the Lichens on the trunks of oak trees, that it is quite difficult to distinguish them, even where we have observed them to there secrete themselves. Probably the most interesting cases of this sort of protective resemblance is to be found among the Wood Moths, *Catocala.* So closely do these moths resemble the bark of certain trees that even the eyes of an entomologist are insufficient to detect their presence, and our best collectors use a willow switch to first drive them from their hiding places, when the exact locality where they alight on a neighboring tree is noted, and by keeping his eye constantly on this while he approaches the tree, the collector is able to locate his moth. The foregoing illustrates what we call protective coloration, or protective resemblance.

Probably no better illustration of protective mimicry can be found in our own locality than that offered by the two butterflies, *Danais archippus* and *Limenitis disippus.* Species of the *genus Danais* are inedible, and in various countries other butterflies that are edible, so nearly counterfeit them in color and coloration as to almost entirely escape the attacks of their natural enemies, the birds. In this way, the last of the two species mentioned is almost completely protected from the attacks of birds by its close resemblance to the former. Romains, in his work on the colors of animals, illustrates with colored figures a case where a South African species of Papilio has the prolongations of the under wings only in the male, the females being totally unlike it and very like three species of *Danais* which they respectively mimic, while in Madagascar, in a very closely related Papilio the male and female are alike in form and nearly so in coloration. Mr. Trimen calls attention to a case where another one of the Papilio in South Africa, the male of which mimics one species of *Danais* and the female another and quite different one. We have a group of moths whose larvæ bore in the trunks of trees and stems of plants, that do not resemble moths at all but various kinds of wasps. One that breeds in the common lilac is almost the exact counterpart of a very common wasp, both in its coloration, form and movements. A small group of beetles have every appearance of the excrement of caterpillars, and on the least disturbance drop either to the ground or into depressions of the leaves on which they feed, and remaining perfectly motionless, are passed by in disgust by the birds who have not learned to distinguish them. Mr. Hudson in his "Naturalist in La Plata" describes a grasshopper, that while at rest is easily recognized as such, but the moment it takes wing it becomes the fac-simile of a very common wasp. Several times since coming to Wooster, there has been brought me specimens of a large worm, allied to the tomato worm, one extremity of which closely resembles the head of a snake. While the cases of protective mimicry among insects are very numerous, in vertebrate animals we find comparatively few. Mr. Wallace has called attention to the mimicry of the aggressive Friar birds by the weaker orioles.

While in protective mimicry we have the very best of evidence of evolution, in that the more closely the mimicing species resemble the mimiced the more likely it is to survive, and vice versa, yet we need to be especially careful that we are not misled by a mere striking resemblance, in order to prove a case of protective mimicry we must show that the animal mimiced is itself protected in some way. Among insects, it is usually because of the distasteful juices or extremely hard or spiny bodies. Then we must show that the mimicing animal is found in the same locality as its protector, in not greater numbers, are always the more defenceless, and the deception is wholly external. A species may be mimiced by several others in the same locality, and by still others in another; or varieties may be mimiced and not the typical species.

Still another kind of mimicry is what we term aggressive mimicry. That is, the animal does not need protection from its enemies, but must be furnished with a more or less complete concealment in order to secure its prey. Here, the animal that is the most completely concealed will secure a better food supply, and consequently be more apt to survive and reproduce than will another only partly protected in this way. A very good illustration is found in an Asiatic lizard, *Phrynocephalus mystaceus*, whose general surface resembles the sand on which it is found, while the folds of the skin at each angle of the mouth is of a red color, and produced into a flower-like shape, exactly resembling a little red flower that grows in the sand. Insects are attracted to what they mistake for flowers and are of course captured and devoured. The Snowy Owl, in England is known to select patches of snow to rest upon while on the lookout for its prey. I always know exactly where to look for some insects that feed on other insects, and are far too slow in their movements to capture them. A small yellow spider is always found on yellow flowers where her body is concealed in a way that she can spring out upon such insects as come to the flowers for nectar. In Java, Mr. H. O. Forbes found a spider that had the exact appearance of a splotch of bird excreta on a leaf, and did not discover his mistake until he had captured a butterfly (that the spider had caught before him) and attempted to remove it from the leaf when he found it was in the clutches of a spider. A few years after, he had picked a leaf in the forests of Sumatra, apparently much like the other, though he was utterly unable to see anything but a splotch as he supposed. While twirling the leaf idly in his fingers, and only when the concealed spider thrust its jaws into his flesh was he reminded that he had found a second specimen, though he was wondering at that very moment why it was he had not been able to do so. I had a smilar experience in Ohio a few years ago, and did not detect my mistake until I had accidentally rubbed my hand over the leaf, and withdrew it with unpleasant expectations, when I found myself face to face with a spider, who appeared to be about mutually disgusted.

Some of the most interesting phenomena regarding colors and their relations to animal life, are included in what we term Warning Colors. Some specimens are of the most brilliant colors, and their coloration is such as to so place these tints as to render the possessors most conspicuous objects. Then, too, these species are always in the most exposed places, with no attempt at concealment, and where it would seem to mean sure death to thus publish their presence. The common skunk is probably warningly colored, though such appears unnecessary, as the odor is apparent at a longer distance than the color, and, with having come in contact with this we at least are willing to take the rest for granted. In the more tropical parts of North America, is found our only poisonous lizard, and we find that it is warningly colored, being blotched with black and pinkish yellow. A kind of frog occurs in Nicaragua, which is extremely conspicuous on account of its bright colors, yet is studiously avoided by creatures that either habitually or occasionally devour frogs. Some of the poisonous reptiles are warningly colored, while others are not—at least not to humans. Very many insects are warningly colored, and sometimes this warning is greatly increased by their exterior appearance. Some caterpillars are colored like twigs of trees, and shaped exactly like them. Many others are of ordinary form but so brilliantly and conspicously colored that they appear to be continually saying, "Here am I, touch me if you dare." There are instances where highly colored insects are edible, and in the case of the crow, which seemingly delights to fill its stomach with brilliantly colored objects without regard to whether these are fitted for food or not, some of these are not thus protected, even though unfit for food, and we here as elsewhere must demand a repetition of experiments under various conditions, before it is safe to make positive assertions.

Some animals like the chameleon, the horned toad, some of the frogs, a little swimming crab, and a shrimp, all have the faculty of changing their color to suit their surroundings. Among insects we find no illustrations of this group. The nearest to approach thereto that I am acquainted with, is a a little hemispherical beetle that in life has the appearance of a drop of molten gold, but if removed and held for a few moments in the hand, the color changes to a dull yellow, without brilliancy. I do not think, however, that this is a warning color.

We have several interesting phenomena that demand some attention, but do not fall directly under any of the foregoing groups. In walking along the shores of Lake Erie, I often observe insects that look very like some that are familiar to me, but on capturing them find to my astonishment that they often do not belong to the same order, and when at rest have an entirely different appearance. The trouble here is that the insects that these most resemble, are not found among them, or at the same time, but often do occur in such places, and the utility of the coloration in the species that they resemble, is still shrouded in obscurity.

The prevailing white color or lack of color in animal life in the Arctic regions is of great interest, but not always to be accounted for on the score of utility to the possessor. The polar bear is white the whole year through, although it does not need protective coloration, and secures its prey more through the sense of smell than that of sight. The musk ox, a comparatively defenceless animal, does not assume the white even in winter, and it can hardly be claimed that its present color adds to its ability to keep together in herds, as these animals have a very rank odor, and their sense of smell is extremely acute, so that even if of a pure white, they need not become separated from each other and go astray. The raven, which extends as far to the north as any other animal life, is as black there as anywhere else. We find ourselves as much perplexed to account for color in one instance as we do for the lack of it in another, yet we cannot discard the whole problem and say there is no utility attached to these phenomena, as in case of the American polar hare, which is white in winter and gray in summer, the color is of very evident value as a means of protection against its enemies. We are simply unable, with our present knowledge of the habits of arctic animals and birds, to work out the problem with any degree of certainty, and must await patiently until we have more light on the matter.

The common rabbit would seem to be, and probably is, protectively colored in its coat of gray, but when running directly away from danger, its up turned stub of a tail, as white as the driven snow, is anything but protective and is almost as much of a signal as the colored lights at the rear end of a railway train. We here have what are termed colors of recognition. In this case it may be to enable the young to the better keep with the parent. Many kinds of antelopes and several species of deer, as well as the Java wild ox, have a conspicuous white patch behind. These seemingly contradict their otherwise protective coloration, yet it is more than likely that these conspicuous white patches, to some degree at least, prevent individuals from becoming separated from the drove on the approach of danger, and in the efforts to escape therefrom. On our northern and eastern farms, where our sheep are highly domesticated, in the approach of danger every individual sheep will start on its own route for a place of safety. In the west and southwest, where they are less domestic, on the appearance of danger every sheep will break for a common center—run toward each other, heads outward in a circle, facing the enemy. Where this sort of combined self defense is followed by any species, it will be seen at once that any coloration that will serve as a protection, and yet enable the possessors to promptly form compact bodies, with stragglers reduced to the minimum, will be beneficial, even though of a slight advantage to the enemy in pursuit. Among insects the under wings are frequently highly colored, and hence only exposed when in flight. In this case the coloration probably enables the sexes of the different species to recognize each other. The eyelike spots on the wings of some insects may prove more attractive to the eyes of birds than the body, and as we very often find such insects with their wings injured, it may be that the body is sometimes saved at the expense of injured wings.

Generally speaking, among birds and insects, and also to some extent among larger animals, the female is far less conspicuously colored than the male. Among birds this is usually true, but where the female performs the labor of incubation in covered nests, it is usually not, while where the incubation falls to the lot of the male, his plumage is less brilliant than that of his spouse. Among insects the female is often much the larger and slowly moving of the two, and, as with the birds, is less brilliantly colored. So we are obliged to admit that coloration is of vast utility not only in protecting animal life. but also that sex which by its nature is more exposed and most in need of natural protection. Besides, when we come to study the fauna of caves, where natural light has never entered, we find color entirely absent, and cave animals are usually blind. Thus, though color is a product of organization, entirely independent of utility, yet where it is practically useless it is entirely absent.

In the study of animal coloration, we are driven between two elements, heredity on the one hand and utility on the other, and these do often seemingly contradict one another. Still, we have far too much proof in our possession, not to be able to see that color has figured very largely in the development of animal life. Among carniverous animals, those that can the most readily distinguish their prey, have the most agility and cunning, are such as are the most likely to survey and reproduce. While of their prey, the most protectively colored will be the most likely to escape and reproduce equally or better protected progeny, and thus color is leading not only itself but muscle and brains a wild race in the struggle of development. In other words, the same Supreme intelligence that first brought animal life into existence, has used these elements that we term colors in protecting and developing this life. "Are not five sparrows sold for two farthings, and not one of them is forgotten before God," is as fair a question now as it was 1800 years ago, and both reply and proof is scattered everywhere about you, and no one need go far from his own door to read it. Why ask men to accept these things wholly on faith, while the proof is written so plainly in the book of Nature, and scattered everywhere, so that only the blind need have excuse for not seeing? It seems strange to one who studies protective colorating, that in England, where these studies have perhaps been carried further than anywhere else, so little utility should be derived from the knowledge thus gained, and the British soldiery sent into battle clothed in the most conspicuously colored uniform, making them the best possible targets for the enemies' guns. Our own nation is not far behind. How many a poor fellow is now mouldering in a southern grave, not a martyr to his country, as we devoutedly try to

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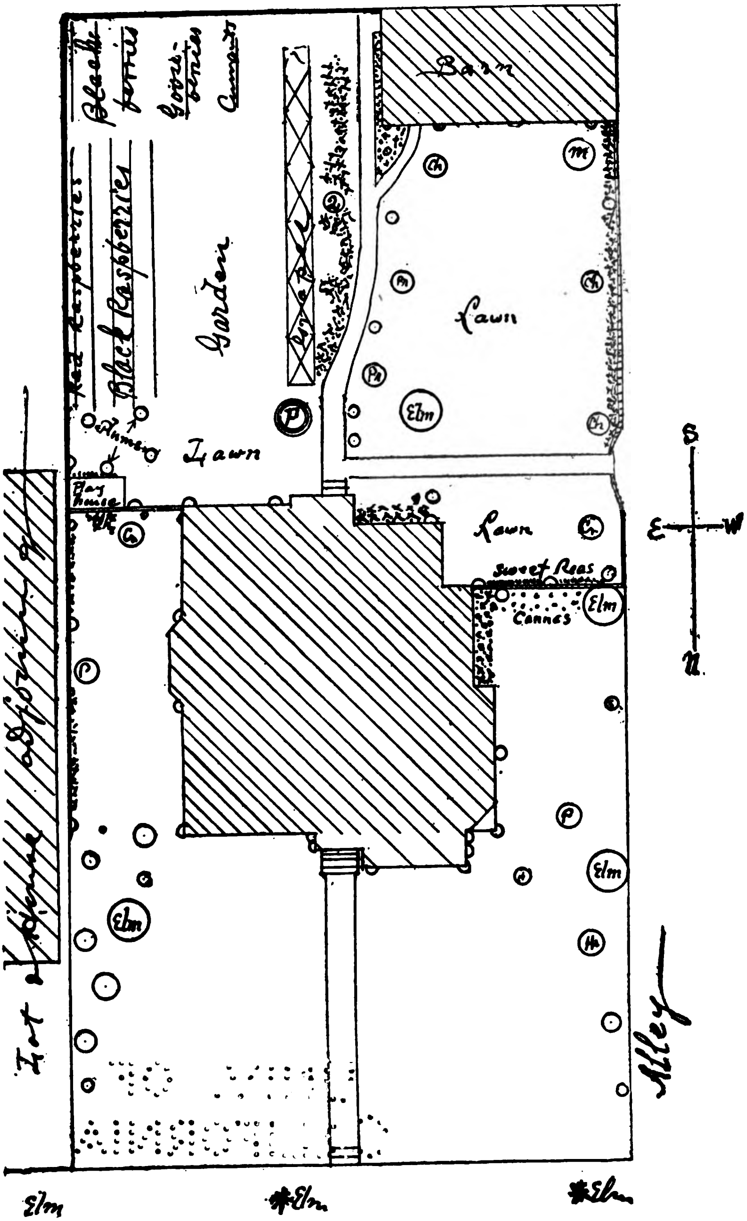

KELLERMAN ON PLANTS ABOUT THE CITY HOME.

believe, but to that senseless law that compelled him to wear a uniform that exposed him by its colors, instead of protecting him, as Nature has done for the most lowly and insignificant of animals. When I saw the North Atlantic squadron in Boston harbor, last summer. it did seem to me as though those war ships had been painted with the express purpose of making the best possible targets for an enemies' cannon. Why do we not take the blue from the soldier's uniform and give him one of green for summer, and another of gray for winter, and put the blue on the war ships to confuse the aim of the foe?

Now, I have given you but a glimpse of the various colorations in animal life, and of course in compressing the contents of volumes into a short paper like this, I have omitted much more than I have included; but if when you observe the colors of birds, of insects or flowers, you will consider them but for a moment, not as having been caused by chance, or created for the express purpose of affording you amusement for an idle hour; but, as being a part of one grand cosmos, every composite part of which is equally soul-inspiring, equally beautiful, equally wonderful, and equally beyond the reach of finite intellect.

PLANTS ABOUT THE CITY HOME.

BY PROFESSOR W. A. KELLERMAN.

(*Abstract.*)

The chart before you (reduced and reproduced on the opposite page) may serve as the basis and illustration of a few suggestions on a subject that is of interest to every owner of a house in the city.

But little space is available in most cases, perhaps none at all if the lot is very small, for planting trees that grow to large dimensions. Yet trees can be planted along the sidewalks on every street in the city. This land does not belong to the landowner, but it is to the latter's advantage, financially as well as otherwise, to plant elms or other suitable trees in front of his lot. The row of trees along the street should be of one and the same species, therefore he should plant what his next neighbors plant, and they should plant the American Elm or some other suitable tree that will stand the test of time. No soft (silver) maple, cottonwood (Carolina poplar), red elms or like grade of trees should be used. If it is desired to plant intermediate trees because the permanent ones are small, then the rapid growing ones named above might be used. But these must be removed as soon as, or before, they manifest the least sign of encroachment on the permanent trees.

If the lot is wide, or if there is a double lot with the house in the middle, trees may be planted at the sides, as indicated on the chart. The front lawn, for the most part at least, should be unobstructed. However, the shrubbery on the sides may usually, to an advantage, be extended well to the front along the margin of the lot. No mathematical, artificial, systematic arrangement should be followed. It will require much more study and planning to approximate the *natural*, yet nothing else should be tolerated.

There may be, at times, a special purpose in planting. For example, trees may be desired here and there for shade; groups may be needed to make screens, or to conceal rear portions of the yard, etc.

The back lawn and rear portion of the lot should *receive as much attention* as the front and sides. The proper quota of shade trees should find a place. Possibly some of the native trees can be used, also the cherry, pear, plum and crabapple. A number of grape vines, also raspberries, blackberries, currants, gooseberries and quinces may be planted. It must be remembered that the general tendency is to crowd the plants too much. The chart illustrates the extent of planting thought desirable.

Some grape vines can be trained to the sides of the barn or rear portion of the house.

Most of the flower beds should be in the rear; in many cases they are admissible at the sides of the house also. They should be designed for ornament and yet placed so abundantly as to afford plenty of cut flowers the entire season.

A fountain with a basin six or eight feet in diameter can be provided in the rear lawn at very small expense. This can be stocked with acquatic plants and animals and be made attractive.

The lattice work at rear posts, and the posts, etc., at the front porch, should be covered with vines. The native ampelopsis and clematis should always be used; also, honeysuckles, climbing roses and numerous other climbing plants, as desired.

A PROBLEM IN INTENSIVE AGRICULTURE.

BY THOMAS F. HUNT.

The subject of the paper that I am about to present is *a* problem in intensive agriculture and not *the* problem in intensive agriculture. I am not going to present the one problem in intensive agriculture, but one of the problems.

Some years ago when I was a student in the college of agriculture of one of our State Universities, I listened to a lecture by that well-known gardener, J. M. Smith, of Green Bay, Wis. He owned forty-three acres of what had been termed a sand bank, along the edge of Lake Michigan. At the time he talked to us, he considered that he only had thirty acres of it in profitable tillage, and from these forty-three acres, only thirty acres of which brought him any profit, he told us that the previous year he had sold $16,000.00 worth of garden products. That was intensive agriculture.

Last summer I was in Colorado, and while there visited the Broodmoor dairy ranch of one thousand acres, operated by Dr. Robert Meade Smith. On this ranch Dr. Smith keeps about two hundred head of cattle, and, at the time of my visit, one hundred and three head were in milk. I visited this ranch on the 12th of July. At this time Dr. Smith was feeding about ten pounds of grain, consisting of a mixture of one part bran, one part corn meal and one part malt sprouts; and in addition, from eight to ten pounds of alfalfa hay. Perhaps you think Dr. Smith raised a portion of this grain and hay. He did nothing of the kind, however; he bought every bit of it and was paying $6.00 a ton for alfalfa, $10.00 per ton for malt sprouts, $21.00 per ton for bran, and $23.00 per ton for corn. The hay was purchased on a neighboring irrigated ranch, while the grain and mill feed were shipped in from a distance.

You may enquire, as I did, what use this one thousand acre dairy ranch was put to. "Why," replied Dr. Smith, "Our milk cows, 103 cows, run in two hundred acres about six hours each day as much for exercise as for anything else, while the rest of the one thousand acres supports the rest of the cattle. It is thus plainly evident that it took the products of several other farms besides this one thousand acres, to support a dairy, all told of, two hundred cattle. This is extensive farming.

The problems of intensive as compared with extensive farming have occupied the attention of thoughtful people in all times, and must continue to do so as long as population continues to increase. It, perhaps, may be reasonably estimated that an acre of good pasture will produce during one season, 150 lbs. of dressed beef. The flour from 15 bushels of wheat per acre contains, approximately, six times as much food value as the 150 pounds of meat. An acre of corn will produce, approximately, twice the food value of an acre of wheat, while there is about 4 times as much food value in two hundred bushels of potatoes as in fifteen bushels of wheat.

The ability of a given area of land to support a population is thus dependent upon the character of the farming. The discovery of America, the consequent universal introduction of the potato into European agriculture and the consequent production on American soil of eighty million acres of corn which produces twice the food value of any hitherto known cereal, has had a most profound effect upon the civilization of the world. It is not merely the man who makes two blades of grass to grow where one grew before that is a benefactor to his race, but the man who, by any means, produces twice the food on a given area that was produced before, is a benefactor to his race. Not only human existence, but all life and nearly all power, and nearly all energy is dependent upon plant growth. The fact that a large part of the energy of the world is now mined from the earth in the shape of coal, or pumped from the earth as oil, or conducted through pipes as gas, only emphasises the importance of plant growth; for all of these substances are the results of former vegetable life.

This subject of intensive agriculture has been studied on the Ohio State University farm by attempting to grow three ordinary farm crops in two years. In 1894 there was cut a crop of mixed clover and timothy hay, between the 7th and 12th of June, from ten acres. Between the 12th and 16th of June the ground was plowed about four inches deep. It was then rolled, harrowed and again rolled. It was then immediately planted to corn. The corn was planted with an ordinary two-horse planter. After planting the field once, we straddled the rows and planted it again, thus making the rows twenty-two inches apart instead of fourty-four. The corn was planted three grains every sixteen inches, in a row, thus putting on the ground four times the amount of seed that is usual for a grain crop. This crop was intended for soiling and for ensilage. A few days after planting the corn was harrowed with an ordinary harrow. After this the corn was gone over three times, at intervals of about a week, with the Zephaniah Breed's weeder. Three teeth were removed every twenty-two inches, in order to prevent injury to the corn. This stirred the ground slightly and prevented many weeds getting a start. With one horse, one of our students harrowed with this tool the whole ten acres in five hours. This ended the cultivation, and besides a little work with the hoe to prevent Indian Mallow from seeding, no more work was done until harvest time. The total cost of plowing the ground, preparing the seed bed, the planting, and seed and for cultivation was $38.10. The yield of green corn from these ten acres was 94½ tons. The cost of producing the corn up to the time of harvest was, therefore, about forty cents per ton. Having plowed the clover sod for corn it was not necessary to plow the land again after the corn had been removed. Two harrowings in opposite directions with a spring tooth harrow put the land in fine condition for drilling in wheat. The labor cost of putting in the wheat was $1.10 per acre. In the spring the field was seeded to clover. Like the fall of 1895, the fall of 1894 was extremely dry. On account of the removal of the corn for ensilage, the wheat was sown rather late. The combination of these two facts resulted in a rather meager growth of wheat. On the whole, it is believed that the wheat was not so good as on similar land not so heavily cropped. In fact the stand of wheat in the spring was so poor that two acres were plowed up and put into corn, much to my subsequent regret. Disasters never come singly and this wheat was, also, somewhat injured by the Hessian fly and chinch bug. The final result was that we got, this summer, 170 bushels of wheat from about eight acres.

It will be noticed that there were obtained a crop of hay, a crop of corn, a crop of wheat, and the ground was again reseeded to clover in two years. The ground has been plowed but once during this time. The labor of plowing the ground, the preparation of the seed bed, the cultivation of the crop, has been for three crops about $4.50 per acre, or $1.50 cents per acre per crop, exclusive of seed. If we succeed in getting a stand of clover, which looks fairly good at the present time, we shall repeat this two year three-course rotation.

The past season another experiment has been conducted which goes still farther than the one just related. During the season of 1894 sixteen acres of fertile river bottom land were in corn. A portion of this sixteen acres was cut up and shocked in the usual way. A portion of it was cut for soiling our milch cows, beginning some time in July, and still another portion was cut up to put in a silo for ensilage. Eleven acres of the sixteen were sown to rye. It was sown in the standing corn in that portion which was cut up and shocked for fodder. It was sown after the corn was removed on the rest of the field, some of it being sown in July, some in August and some in September. That which was sown in the standing corn was sown about the first of August. That which was sown after the corn was removed was better than that which was sown in the standing corn. The late sown was about as good as the early sown. On April 27th of this year we began cutting this rye and using it for soiling the milch cows, which was continued until May 7th, when it became so tough that a large per cent. was left uneaten. We probably used up two acres in this way. The rest of it was cut to put in a silo for ensilage. Something over thirty tons were put in the silo. The latter part of June over five tons were taken off the top of the silo and thrown away. The rest of the silage was in fairly good condition and, when scattered in the pasture and in the paddock, was eaten up fairly well. One objection to the rye silage is its peculiar odor. A ton of rye silage was not nearly as valuable, we thought, as an equal amount of corn silage. On the whole it is doubtful whether it would be wise to repeat the operation of making rye into silage, even if there were no other reasons against it.

In the first experiment mentioned, three crops were obtained in two years. In this one two crops were obtained in one year. It was thought desirable to repeat this operation. The field was therefore again planted to corn as soon as the rye was taken off, and also the rest of the sixteen acres above mentioned, as well as four acres more which had been in clover and millet the year previous. This whole twenty acres was given substantially the same preparation* and was planted to the same variety of corn during two days of the last week in May. On account of the excessive drought, none of this corn came up until after June 20, when about an inch of rain fell. Then a marked difference occurred. Every portion of the field which had not been in rye came up promptly with a good stand and grew thriftily. That portion of the field which was in rye came up slowly, was only a partial stand, and, throughout the season, barely struggled for existence. It happened that in planting the corn the rows passed diagonally across that portion of the field which had been planted in rye, and that which had not been. The difference was so marked as to cause wonder and astonishment on the part of every one who was shown the field. Many experienced persons said to me that they could not have believed that such marked differences could have existed with all the conditions the same except the rye treatment, had they not seen the results with their own eyes. When the crop was harvested there were twice as many good ears where there had been no rye, the ears were eight to nine inches long instead of six to seven inches long, there was about two and one-half times as much fodder, and, finally, there were 49 bushels of corn in place of 16 bushels where rye had been sown, counting 70 lb. ear corn per bushel.

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*That portion of the field that was not in rye was plowed, perhaps two weeks earlier than the rest of the field.

The question arises as to what made this most striking difference in the yield of the corn. All the land was substantially alike. It was fertile, river bottom land and both portions had been heavily manured with stable manure during the past winter. The difference could not be due, therefore, to any lack of fertility. It seems to be a fair inference that the good crop of corn in one case and the almost total failure in the other, was due to the fact that there was not enough of rainfall to grow two crops in one year.

It has been found, for example, that to grow a pound of dry matter in Indian corn, three hundred pounds of water must be evaporated through the leaves. In the case of oats it has been found that it requires five hundred pounds of water for each pound of dry substance produced. These figures, perhaps, may be taken as the minimum and maximum amounts required for production of vegetation.

In some artificial experiments which I made myself, I found that the evaporation from oats and oat stubble ground during 1886, between January 9th and September 26th, was equal to only twenty-eight inches of rainfall. This was a good deal more than the rainfall which fell during the same time. It is about equal, I believe, to the total rainfall for this year.

It is evident, therefore, that before we could grow another crop of oats on this land, we must let the land rest so that it can catch up in soil moisture. The difficulty in the rye field was that the growing of the rye up to May first had so exhausted the soil of moisture that, together with the subsequent deficient rainfall, the land was unable to grow a full crop of corn. Probably, if the rye had been plowed under early in the spring, the deficiency of soil moisture would not have been so marked. Probably, also, if the rainfall had been abundant, there might have found much less disadvantage from the growing of the rye crop, and, possibly, if the rainfall had been excessive, there would have found no injury whatever. At any rate, this experiment will be repeated to see what the result will be in a different season.

The quality of soil moisture is, therefore, one of the problems in intensive agriculture. The amount of vegetation which we can support on a given area is conditioned upon the amount of soil moisture. We are not prevented from raising two ordinary farm crops in one year because of a lack of sunshine, or because of a lack of plant food, but we may be prevented from doing so because of insufficient amount of soil moisture, which is conditioned, primarily, upon the rainfall, although it may be modified by manuring, tillage and drainage.

THE PEACH—ITS HISTORY.

The history of the peach is shrouded in obscurity. It was given its botanical name *Persica* (Persian) because it was thought to have been a native of Persia, but DeCaudolle thought it of Chinese origin, and L. H. Bailey says, " it is now considered that the peach is a native of China, although it is not known to have been found truly wild." De Caudolle says "The peach, as we know it, has been nowhere recognized in a wild state. In the few instances where it has been said to have been found wild, the probabilities are that the tree was an escape from cultivation. Aitcheson, however, gathered in the Hazardavakht ravine in Afghanistan a form with different shaped fruit from that of the almond, being larger and flatter. The surface of it (he says) resembles that of the peach in texture and color and the nut is quite distinct from that of the wild almond." But it is admitted that the almond grows wild there.

Some have contended that the peach was introduced from Asia Minor or Persia, and Aitcheson's discovery of a form like a wild peach adds some force to this idea. But De Caudolle, from philological and other considerations, thinks the peach of Chinese origin. It has not been found wild in China, but it has been cultivated there from time immemorial. It has entered into the literature and folklore of the people, and it is designated by a distinct name " to " or " tao," a word found in the writings of Confucius five centuries before Christ, and in the writing five centuries earlier. It has no Sanscrit name, and is not mentioned in the Hebrew Scriptures, Calocott's Scripture Herbal names one hundred and twenty-four different plants and fruits, but does not name the peach. Xenophen does not mention it, but Theophrastus, a century later, speaks of it as a Persian fruit. De Caudolle suggests that Alexander may have introduced it into Greece. The cultivation of the almond is believed to have been introduced into China about the Christian era.

M. T. Masters says: "It may, however, well be that the peach and almond are derived from some pre-existing and now extinct form, whose descendants spread over the whole geographic area mentioned, but of course this is mere speculation, though indirect evidence to its support might be obtained from the nectarine of which no mention is made in ancient literature, and which, as we have seen, originated from the peach and reproduces itself by seed."

Pliny says the peach "came from Egypt to the island of Rhodes, where it was barren. The peach of Persia was reported to be poisonous, and was transplanted to Egypt in order to inflict punishment."

Chambers says that the peach is a "native of Persia and the North of India," but it may be assumed there is not sufficient authority for the positive statement.

Mr. M. P. Masters says "some have classed the peach with the plum as *Prunus peosica*, others with the almond, *Amygdalus*, and others as a special genus, *Persica*.

Fulton says, "It has often been found growing spontaneously in Asiatic Turkey," but in that he is probably in error. His history is rendered doubtful by his statement that "There is no doubt but it was one of the 'Trees of the Garden' which God planted in Eden, and which was to nourish and cheer our first parents in their vistine purity and happiness." To this the most appropriate criticism would seem to be that of John Quincy Adams on the apple and the talking serpent. *Credet Judaeus Appella*—(let the circumcised Jew believe it.)

Pliny says, "Asiatic peaches are distinguished respectively by the name of the countries of their origin * * * Originally they were sold at the rate of a denarius apiece" (which was at one time valued at about sixteen cents American money), "some, in fact, have sold before this as high as thirty sisterca (about one dollar and twenty cents) apiece; that has never been exceeded by any other fruit." But he adds, "There is none that is a worse keeper, for when it is once plucked, the longest time that it will keep is a couple of days."

Not only is the habitat of the peach unknown, but, whether it was in the original form as we now find it, or whether it was derived from some other form, is equally obscure. Bailey says, "The opinion of Knight, cited by Darwin and others, that the peach is derived from the almond, is not generally accepted."

It has never been found in a wild state. Nothing resembling it has ever been found wild except in the case in Afghanistan, before stated.

Darwin cites several cases, not only of gradations between peaches and nectarines, but also between the peach and the almond. So far as we know, however, no case has been recorded of a peach or nectarine producing an almond, or *vice versa*, although if they are of common origin, this might be expected. "The botanical evidence seems to indicate that the wild almond is the source of cultivated almonds, peaches and nectarines, and hence that the peach was introduced from Asia Minor or Persia, from the latter of which came its name, *Persica*; and Aitcheson's discovery in Afghanistan of a form like a wild peach adds favor to this idea." Darwin thought the peach a modification of the almond.

Mr. Masters, a British authority, puts it under "exotic garden plants," and it is from this side that all British authors look at it. Mr. Masters says, "There are two principal races, the peach proper, which has fruit covered with a downy skin, and the nectarine, which has a fruit covered with a smooth skin. The peach and the nectarine would therefore appear to be distinct kinds of fruit, and indeed have an appreciable difference in flavor, but as both peaches and nectarines have been known to grow on the same branch, and individuals half-peach and half-nectarine have been produced they must be regarded as merely varieties of one kind of fruit." * * * * The seeds of the peach will produce nectarines and *vice versa* and it is not very uncommon, though still exceptional to see peaches and nectarines on the same branch, and fruits which combine in themselves the characteristics of both nectarines and peaches."

Masters says further that "The nectarine is a variation from the peach, mainly characterized by the circumstance that while the skin of the ripe fruit is downy in the peach, it is shiny and destitute of hairs in the nectarine. To this add the very important fact that the seeds of the nectarine, even when that nectarine has been produced by bud—variation from a peach, will generally produce nectarines, or, as gardeners say, "come true."

McIntosh, in "The Book of the Garden," says, "The peach and the nectarine, although in cultivation spoken of as two distinct fruits, owe their origin to one and the same parent, *Amygdalus Persica L., Persica vulgaris of Millen.*" What does he mean by that? The *Amygdalus Persica of Linnaeus* or *Persica Vulgaris of Millen* is the peach. Was the peach its own parent? That is trenching on Mythology.

Botanically, Gray places the peach under *Prunus* (the ancient name of the plum). As now received, the genus comprises all the following groups, which it has been found impracticable to keep up as botanical genera. Foliage and the stone and kernel of the fruit, usually with the flavor of prussic acid, especially in the peach and cherries." He includes under the term *Prunus* the almond and peach, the apricot and the plum and the cherry.

The peach is *Prunus* (*Amygdalas*) *Persica*, and Gray says, is "cultivated from Asia for the fruit, also a double flowering variety for ornament, small tree with purplish, rose-colored flowers, bell shaped calyx, lule lancealate leaves, and globular fruit ripening a thick pulp, either clinging to or separate from the rough, wrinkled, porous stone."

L. H. Bailey says the name peach comes from old French *pesche* or modern French *peche*. It was once known as Persian apple, because it was believed to have come from Persia, and because anything especially good was "apple." Mr. Bailey says there are some writers who prefer to retain the old genus *Persica*, and who call the peach *Persica Vulgaris*. He says "the tree is usually short lived, rarely living beyond fifty years, and under the strain of high cultivation and heavy production it usually perishes or becomes unprofitable before the twentieth year."

"The peaches proper, exclusive of the nectarines, fall into two general classes, the clingstones or paves, and the freestones. * * * These classes grade into each other, especially in the early peaches of the Hale Early type, which are pronounced clingstones in ordinary or dry seasons, but which may become nearly free in moist seasons. The clingstones are now little prized in the eastern States, because they are difficult to prepare for culinary uses, but they comprise the chief California peaches which are now shipped to the Eastern markets.

"Each of these classes may be again divided into white-fleshed and yellow-fleshed peaches, of which the former are, in general, of the finer quality; but the latter are much more popular in the market, and are therefore mostly grown in the United States. There are also various red-fleshed or blood peaches, but they are little grown. The flat peaches, sometimes considered a distinct species (*Prunus platycarpa*), are really only a modification of the common peach.

"They are sometimes flattened to little more than the width of the stone. The Peen-to is the chief representative of this class in the United States."

Chambers says the flat peach is of Chinese origin and has nearly evergreen leaves.

Fulton, in " Peach Culture," says there are ten species of the genus. Among those most important are the peach and four roots of almonds.* He says, " Of the peach there are generally reckoned two varieties, the peach proper with downy fruit, and the nectarine, with smooth fruit. There is abundant evidence that the latter is a mere accidental production of the former."

Some trees have grown two feet in diameter on Delaware Bay. There are orchards in Maryland and Eastern Virginia that are more than seventy years old and still bearing, and it is believed they will continue to bear till one hundred years old. One tree at Villeneuve is certainly ninety-three years old, and believed to be one hundred, was but ten inches in diameter.

Tradition says the Monks took the peach into Mexico, and the Maryland peach growers claim that the peach was introduced into this country by Thomas Roberts about one hundred and twenty years ago, but that needs confirmation.

Among the earliest notices of the peach in America is the following from the letter of Millian Penn to the " Proprietors", August 6, 1683. "Here are also peaches, very good, and in great quantities, not an Indian plantation without them, but whether naturally here at first, I know not ; however, one may have them by bushels for little, they make a pleasant drink, and I think not inferior to any peach you have in England, except the true Newington.

Mr. Bailey says, "The peach thrives in those warm and mild-temperate climates which abound in warm days and bright sun. * * * * There is no country in which the peach is cultivated so commonly and with such great success as in the United States."

One of the latest authorities on the peach says, " The Melocoton tribe is still the most popular in the northern part of the United States. The red check Melocoton was a famous peach of American origin, which is now scarcely, if at all, known in its original form. It was a firm, yellow fleshed peach, with a red-splash cheek, and a prominent tip like projection upon the apex. It is now represented by the Early and Late Crawford, and many others of the same type ; and the Elberta, which is now the leading peach of the Southern and Middle States, is undoubtedly the off-shoot of the same type. The Hale Early type, represented by many varieties, is still prominent. This class is characterized by rather small or medium sized fruits, with white flesh of indifferent quality and clinging more or less tenaciously to the stone. These are chiefly valuable for their earliness and productiveness.

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*The Peach of the English ; the Peiche of the French ; Pesca, Italian ; Persigo, Spanish ; Persego, Portugese, and Pfersich, German.

"Other important varieties are Mountain Rose, Old Mixon, Hill's Chili, Stump, Smock, Salway, Stevens' Rareripe, Chinese Cling and Honey, the last two being chiefly grown in the Southern States. The leading peach shipped from California is the Lemon Cling or similar varieties."

McIntosh says the peaches of Pekin are celebrated as being amongst the finest in the world and of a very large size.

McIntosh, in the "Book of the Garden," says, among the most serious diseases of the peach are "canker, mildew, gum, honey-dew, wrinkling of the foliage, and blotches on the young wood, as if scarred by adhesion." As to mildew he quotes Knight as saying he attributes it "to a derangement of the foliage, caused by the leaves absorbing an excess of moisture from the atmosphere under certain conditions." Knight says "I have proved that * * * much water will be absorbed by the leaves of trees and carried downward through their alburnous substance, though it is certainly through this substance that the sap raises, under ordinary circumstances." That suggests the query, "Does the sap go upward and the water downward 'through their alburnous substance' at the same time?"

McIntosh enumerates among the enemies of the peach, red spider, thrips earwig, figure of 8 moth, the peach or poplar saw-fly, more than one species of aphis, and turtle scale.

Darwin says, "another disease (he does not name it) attacks yellow fleshed far more than those with other colored flesh."

The chief disease of the peach is the yellows, generally considered a disease of unknown origin. Black, in the "Cultivation of the Peach and Pear," says, "I believe that the yellows is a bacterial desease, as is now understood." Fulton, in "Peach Culture," says it "is yet a subject of speculation. * * * We have no sufficient data to enable us to speak unhesitatingly, but we believe its *primary* cause is *bad cultivation.* * * * At an early day in this country the yellows was unknown, and in newly cleared districts it is yet unknown, save only where it has been introduced by diseased trees."

Nearly all authorities admit the "disease to be of unknown origin, which always terminates fatally," and is contagious.

Prof. Maynard says, "in reviewing the subject, I draw the following conclusions: The peach tree is by Nature a delicate tree, and sensitive to the sudden changes of our climate; that many causes are at work by which the trees are still further weakened, and only when weakened are liable to the disease known as 'the yellows"; that this disease may be largely prevented by cultivation and fertilization ; that diseased trees may be so treated as to recover and produce good fruit ; that there is no royal highway to success in the cultivation of this fruit, but that eternal vigilence is the price of an abundance of peaches."

Some assert that "it is now known that the disease is not due to any particularities of soil or climate, nor to injuries, insects nor parasitic fungi. It is communicable from tree to tree, although its method of spread is unknown." An affected tree may live from three to six years. There are laws for the suppression of the disease in several of the peach growing States.

Black says, "I believe the yellows is a bacterial disease. * * * I believe these bacteria exist in the healthy tree and even in healthy men, but when their number becomes greatly increased, which may take place rapidly under favorable circumstances to an infinitesimal (?) number they become a disease." They may "exist in normal and healthy members. * * * These bacteria, which I say do exist in healthy trees, becoming increased indefinitely, cause disease. * * * Now, from any cause let these bacteria increase a million fold or more, as they may rapidly do, then they become a source of disease, and here, to my mind, we have the cause of yellows in the peach."

The writer is not a botanist or a peach grower, nor neither is he a bacteriologist, but he will venture a suggestion :

Black inclines to the opinion from practical and not, as yet, from scientific data, that peach-yellows is contagious, and can be carried from tree to tree through diseased seed, through diseased buds, through proximity of soil, and even by pruning instruments going from diseased to healthy trees. So much am I impressed by this suspicion that I would not haul young trees in a wagon which had shortly before hauled the cuttings from pruning a diseased orchard, unlesss the wagon had been fumigated." He adds' "Experience is showing that potash is a remedy for the yellows."

Mr. Black claims that "bacteria exist in the healthy tree and even in the healthy man," but when they rapidly increase under favorable circumstances "they become a disease." If you approach a swamp, you will probably find some of the weeds and bushes of the swamp growing on its margin, but stunted and small, while in the swamp they are full grown and vigorous, because they find their habitat, their proper place.

The weeds and bushes do not create the swamp, but they thrive there because they there find their proper nutriment. May it not be so with the microbe on the healthy man or tree? It cannot thrive for want of proper conditions, but so soon as either become diseased, the microbes then increase and multiply. Is not the theory enunciated by Mr. Black that the yellows is a "bacterial disease" an assumption lacking proof?

He says: "Before proceeding further, I want to lay before the reader the present (1896) status of the germ theory of diseases." He then quotes Cohn's classification of what Cohn terms *Schizomycetes*, and adds, "To show the power of reproduction of these germs, it is said that one of them can give rise to 100,000 individuals of its kind in seven hours. Think of it! Suppose a healthy peach tree has 10,000, then conditions favorable to disease surround it, and in seven hours 1,000,000,000 bacteria." And that, according to Mr. Black, is the "present status" of his theory. The life of a diseased tree may be shortened by bacteria.

He advises: 1. Plant only natural seed, and cull it thoroughly.

2. Use only choice buds from choice trees, in every way healthy, and from trees that have been raised from natural seed as far back as possible, and budded only from such stock.

3. Use care in selecting the site of the orchard.

4. Cultivate thoroughly.

5. Prune judiciously. If a tree is attacked, cut out all the diseased parts at once and burn them; cut back the new wood at least one half, and fertilize freely.

6. If the tree is bark-bound and the sap seems deficient, slit the trunk and the large branches on two sides for their whole length.

7. Avoid raw manures of all kinds in the orchard, and use lime very sparingly.

8. In fertilizing, use, chiefly, chemical fertilizers by the rules given, and especially those containing some salt of potash.

He adds: "After a while, when this matter is properly cared for, we will find out the peculiar form of bacteria that cause peach-yellows, and I do not despair of a remedy following discovery."

Mr. Black quotes Professor Maynard, who says, "we are told it (the yellows) was very destructive one hundred and twenty years ago."

Professor Maynard says, "when the tissues become diseased from any cause, the proper conditions are produced, the germs found everywhere begin at once to develop."

He says, while he has no positive proof that the disease is not contagious, I do seriously doubt that any one has positive proof that it is; certainly I have never seen such proof stated." * * * The condition of the tree determines its susceptibility to take the disease, and he claims that diseased trees may be so treated as to recover and produce good fruit.

Meehans' monthly for February, 1894, says, as a result of our actual experiments made many years ago, * * * the writer ascertained positively that the disease called the yellows was caused by the work of a fine cobwebby spawn of a mushroom, which proved to be *Agaricus melleus*, which attacks the roots of the peach tree." He says it also attacks the white pine and Norway spruce, and that "Dr. Dyer has now discovered that another species of mushroom or toad stool, *Agaricus squarrosus* has the same disastrous effect on trees as the *Agaricus melleus.*

In the monthly for April, 1894, Mr. Meehan says he "believes that it is extremely unlikely that the yellows will ever be seen either in California or Florida. Aside from this he has found by absolute experiment that the mycelium of *Agaricus melleus* applied to the roots of peach trees, as with other trees, will infallibly produce the disease, and that the inference is that this fungus is the cause of the disease, and is unable to develop in some countries, on account of climatic conditions."

Curled leaf, or leaf curl is a disease of the peach. Black says he "can't say that it has done damage to the trees or the fruit. * * * Like the yellows, it is of bacterial origin," but he says, also, "I venture the conjecture that it is caused by a fermentation in the leaf during the phases of the starch changing to sugar, caused by the increased presence of bacteria, which revel and increase prodigiously in just such changes of temperature."

One writer mentions the singular fact attested by all peach growers, that while certain peaches are liable to the attacks of a parasitic fungus known as mildew, others are not. * * * In the case of the peach, this peculiarity is in some way connected with the presence of small glandular outgrowths on the stalk, or at the base of the leaf. Some peaches have globular, others serriform glands, others none at all, and the latter trees are much more subject to mildew than are those provided with glands.

The borer is the most troublesome enemy of the peach, yet if looked after in time, it is very easily subdued. Its presence is always indicated by gum, and it can easily be destroyed with a wire.

The borer was first described by Say, in the "Journal of the Academy of Natural Sciences," Philadelphia. It is so well known as to need no description. Numerous remedies or preventives have been proposed. Harris advises removing the earth from around the body of tree down to the roots, crush or destroy all the cocoons and insects, then cover the wounds, if any, with wet clay, and surround the trunk with sheathing paper about nine inches wide, extending down to the roots. Surround the lower edge of the paper with wet clay, to keep it in place, and tie the top. Do this before the first of June. In the fall remove the paper, examine the tree carefully, and renew the paper in the spring.

Whenever gum or "sawdust" is seen about the body of the tree, or in the forks, use your knife and probe, clean out the hole, plaster it over with common soap or with the common carbolic soap of the shops, and soap the bark of the tree or apply a tree-wash.

Some say gas lime is obnoxious to borers, by spreading a quantity around the tree.

Boiling water is recommended by some as a safe remedy, and some have commended painting the tree twice a year, spring and fall, with coal tar. The horticultural papers of late date have an advertised preparation for the same purpose.

Thrips are mentioned as an enemy of the peach. Black says, "may be the European peach-louse, (*Aphis Persecae*). It injures the leaves.

The Bark-Louse is named by Black and Harris as an enemy of the peach. The former advises, as a remedy, two parts of soft soap and eight parts of water, with lime enough to make a thick white-wash ; work thoroughly into the crevices of the bark and affected parts.

Our familiar friend, the curculio, is set down as an enemy of the peach—the fruit, not the tree, The "sure cure is jarring the tree, and catch and mash the "Little Turk." Black advises to "scatter air-slacked lime over the tree as soon as you see the fruit appearing, once a week for six weeks. Use flowers of sulphur several times in the same way, or put it in white-wash with a little glue in it, and throw over or spray the trees with any of the syringes or pumps now in use."

Some speak of the June-Drop as a disease of the peach. It can be as well termed a disease of all fruit trees. The explanation would indicate that it is not a disease, but simply a provision of Nature, which provides for the survival of the fittest. The tree starts more fruit than it can properly nourish, and the weak ones fail to secure nourishment and drop off.

Among the fungus diseases of the peach are named the twig-blight and fruit-rot, caused by a fungus, *Monitia fruetigena.* Spraying with Bordeaux mixture in the spring, before the flowers appear, is thought to be the best remedy.

The foliage of the peach is so tender that spraying with Paris green often injures it, and it is doubuful if it is generally sufficient.

The peach-curl, in which the leaves and twigs become swollen and much curled and deformed, is caused by a minute parasitic fungus, which penetrates the tissues of the leaf and finally produces spore sacks upon the surface. Scribner recommends the early removal and destruction of all the diseased leaves and shoots, and spraying the trees in early spring with a forty or fifty per cent. of iron sulphate.

Rosette, a somewhat similar disease, but worse, is said to occur in Georgia and Kansas.

Pliny says: "Peaches again, are more wholesome than plums, and the same is the case with the juice of the fruits extracted, and taken in with wine or vinegar. Indeed, what known fruit is there that is more wholesome as an aliment than this? There is none, in fact, that has a less powerful smell." A note by the translator says, "A most singular assertion, as Fe'e says, and one that universal experience proves to be unfounded." Pliny adds, "or a greater abundance of juice, though it has a tendency to create thirst," to which the translator's note says, "on the contrary it quenches thirst." Pliny says the leaves of it, beaten up, and applied topically arrest hemorrhage, and the kernels mixed with oil and vinegar, are used as a liniment for headache. Stewed, it is used in slight cases of constipation."

Another authority says, "the leaves, when fresh, have the smell and taste of bitter almonds, and by bruising them, mixing the pulp with water, and distilling, the *Peach-water* is obtained, which is so much esteemed by many for flavoring articles of cookery."

Chambers says that the leaves have been employed as a sedative and as a vermifuge. The seeds almost entirely agree in their properties with bitter almonds, the flowers exhale an odor of bitter almonds, and both seeds and flowers are employed in the manufacture of a liquor called Persica."

Pliny says, "the young branches, leaves, flowers and seeds, after maceration in water and distilled, yield a vegetable oil which is chemically identical with oil of bitter almonds:

"The bark, the leaves, the kernels, and even the flowers are endowed with active properties, which they owe in part to hydrocyanic acid. The flowers are chiefly laxative and the leaves are not destitute of this quality. Indeed, they have been used as a substitute for manna, and especially for their vermifuge effects ; they have also been reported to cure *intermittent fever* and to allay the pain of *nephritic colic*, as well as to promote the discharge of calculi by causing diuresis. Bruised and applied to the abdomen, they are said to relieve colic produced by indigestion. They are also reported to have cured *whooping-cough*. They have been applied to arrest slight *hemorrhages*. Peach kernels have frequently produced poisonous effects. * * * The leaves and also the flowers may be prescribed as an infusion, and a syrup prepared from them or from the bark, has also been used."

Among the dye-woods in use is the peach wood or Lima wood, which yields a fine "peach color," whatever that may be. In the "Rogues Lexicon," the word peach is defined as "To inform ; to turn stag ; to blow the gab ; to squal or squeak ;" that is, to inform on a partner.

In 1885, peaches were shipped from Clayton, Delaware, to Liverpool, every peach being wrapped singly and packed in ventilated boxes. They carried in good order, and were sold at a good profit, selling at nine dollars per case, when the total cost was four dollars and eighty cents.

Fulton says, "As a dessert, the peach is a universal favorite and in its season has no rival. It is the 'Queen of Delicacies.' * * * When the weather is so hot that even eating is a labor, the peach is acceptable, for it *melts* in the mouth without exertion."

The first notice that I have found of canned peaches dates about thirty-five years ago, and glass jars were then used. Large shipments were made to Europe. Canning has now grown to an immense business.

Peaches are largely used for conserves, which, according to Black, is. "to nearly half preserve them with syrup, then dry them on dishes in the sun, covering them up to keep off insects, and when thoroughly dry, pack them carefully in pulverized white sugar," and he adds, "they will keep for years."

"Preserves" are made by carrying the first part of the process a little further.

With our grandmothers peach leather was a favorite delicacy. It was made by paring the ripe fruit, mashing it thoroughly and spreading it in a thin layer on a board (not pine) or dish, and drying in the sun.

Pickles, marmalade and jam from the peach are familiar. The evaporation of the peach has grown into a large business, and when properly done, and the fruit of fair quality, it produces an excellent food.

Some have claimed that sun-dried peaches, under the most favorable circumstances, lose, both in weight and flavor, when compared with those dried in an evaporator, or by convected heat.

Fulton says, trees produced from seed are more vigorous, free from disease, hardier, more certain bearer, and live longer than when produced by inoculation; but as the character of the fruit is uncertain and the quality generally inferior, this method has been altogether discarded, except when new varieties are sought. Although the peach may be grafted with success, it is so tedious and unsatisfactory when compared with budding, that it has been totally abandoned for the latter.

He says, also, in planting seed for nursery stock, "the seed should be selected with great care," * * * "for if diseased seed be used, the young trees will not only be feeble and sickly, but the disease will most probably be disseminated in all directions."

"No seed, therefore, should be taken from an orchard that is diseased," especially with the yellows.

"The seed should be of *natural* fruit. It is more vigorous, more hardy, more certain to germinate, and the trees live longer."

"The first effort of nature seems to be in the reproduction and perpetuation of the tree in health and vigor; that of art, the production of fruit of the richest flavor and most delicate beauty. Both, in perfection, are unattainable in one tree. If we want highly vigorous and loug-lived trees, we must never bud or graft; but if we wish rich, luscious fruit, we must do both."

Black says, "the peach should be grown only from the natural or unbudded fruit. Nature advances and does not retrograde, and this crime against Nature, of breeding in-and-in is followed in all phases of life by degenerate offspring. * * * I attribute a great deal of the loss and disappointment in the peach business to the reckless, careless nay, almost criminal way, in which the propagation of the trees has been carried on. I personally know where seed from evaporators has been taken away indiscriminately for the purpose of raising nursery stock.

"Not only should the seed be from natural fruit, but even this should be carefully gone over, only the very best specimens being selected for planting."

Some growers are reported as growing only seedlings, claim-to have as good results as from budding, both in quality and quantity, with hardier trees.

The United States is the only country in the world where the peach has been a marketable commodity within the reach of all. In New York the sales have been 50,000 to 160,000 baskets per day.

The peach can be cultivated anywhere in the United States below 42°, but not safely above 40° and below 9000 feet. The Delaware Peninsula, all Delaware, and the eastern shore of Maryland and Virginia, about 6000 square miles, is the great peach region of the world. It sent to market, as long ago as 1869, 1,000,000 baskets, and some of the orchards, at that time, contained 600 acres.

To this must be added Georgia, Michigan and California. Michigan is almost entirely north of 42°, but being nearly surrounded by water, seems to be the natural home of the peach. One hundred years ago peaches were grown in Virginia, and a large portion of the fruit was used for the distillation of peach brandy, which has a peculiar flavor that made it popular. Tennessee peach brandy was also freely used. The usual price for peaches was about twelve and a half cents per bushel.

The census of 1890 reports 36,367,747 bushels of peaches in the United States in the year 1889, which was about one-fourth the amount of the apples (143,105,689 bushels) and more than six times as much as all the apricots, cherries, pears and plums. The census of 1890 reports the annual sale of 6,000,000 trees.

FAVORITE FLOWERS.

BY J. H. LAGEMAN.

Although I do not expect to give you anything new, I hope to satisfy you with this short essay on flowers. In presenting this paper I feel somewhat embarrassed, as I am sure some of you have better literary sources than I, on the subject.

For many centuries people seem to have selected certain flowers as favorite pets, although we don't find any mention of it in history, before Roman history.

The reason why certain flowers were more selected for display and show, seems to have been on account of color, form, odor, variety and easy culture. A pleasing color, a pretty formed corolla displayed in many variations, and a sweet odor are, in a few words, descriptive of a favorite flower. But the old proverb says that tastes are different, so we find flowers liked by some persons and disliked by others. Then there are some flowers that are agreeable to everyone—first of these is the rose.

The rose was greatly honored by the ancients, although, according to Plinney, they knew only four kinds. The celebrated father of Botany, Linnæus, knew about 17 varieties, Curt Sprengel, 115, Tractinick, 240. These last were reduced to 24 by Wallroth.

The feasts the old Romans gave in the glorious days of their supremacy over the world, we have all learned in history, but few may know that the Queen Cleopatra once gave a banquet to her lover, Altonius, where $1000 were spent on roses.

The feast of roses is celebrated in China, and other countries, at the present day, but the greatest sums are spent for roses in France. More than a million dollars worth of these flowers are annually exhibited in Paris.

The aster was introduced into Europe, from China, in 1732. In 1865 there were exhibited in Erfurt 280 varieties of asters. The dahlia, or georgine, as it is called in Germany, was sent to Madrid from Mexico by Vincent Cervantes in 1784. There are now cultivated, more than 2,000 kinds. England at times has offered from $100 to $1000 for the best new variety of aster.

The tulip was brought from the Orient into Germany by an embassador in 1560. It was named *Tulipa gesneriana* in 1559. In 1557 it found its way to England, Belgium, and Holland. In 1629 Parkinson enumerated 140 varieties. About 1634 the so-called tulip fever broke out in Holland and single bulbs were sold for five, ten, fifteen and twenty-five florins—yes, the celebrated *Tulipa semperaugustus* was sold at 13,000 Dutch florins. In 1637 a rich man sold 120 tulip bulbs for 190,000 florins for the benefit of an orphan's home. Linnæus saw one sold for 6,700 florins when he was living in Holland about 1740.

The pink is extensively cultivated by florists and is probably next to the rose in popularity.

The chrysanthemum came to France and England from China and Japan about 100 years ago. The Horticultural Society of London in 1824, cultivated 24 varieties. In 1825 the first chrysanthemum show was given in London. Seven hundred pots with 10,000 flowers were shown. The flowers were small and modest. One should visit the forcing houses of this city to get an idea of the size of chrysanthemums now. In 1842 eighty different varieties were shown in Germany, and in 1861 about 400 varieties were enumerated. It has become the flower of fashion of the whole world, but I think it unfit for a national flower of this country because it is not a real American plant.

So far all the lovely children of spring, summer and fall have stood back in due respect, but now they come rushing up and beg of me not to leave them out. So come the geraniums of all kinds, hollyhocks, lilies and gladiolus. I must not forget the beautiful sweetwilliam, of which I have seen the finest in the middle of a pine woods, planted and cultivated by an old parson in my native country. Then should come our pansies, bluebottles and centaureas.

Last I shall leave it to my friends to put in their favorite pets of home, lawn, park, garden, greenhouse and cemetery.

ENTOMOLOGICAL NOTES—SCALE INSECTS.

BY E. E. BOGUE.

The Red Scale of Florida, *Aspidiotus ficus*, is present in several greenhouses in Columbus, and the same has been received from Berea, O., and St. Louis, Mo. It occurs on several species of different families of plants.

What may be called the snowy scale, *Aspidiotus nerii* Bouche, is present in the greenhouses of the city, in a large number of different species.

Of the so-called "soft scales" the three common species of Leconium are present, viz.: *L. hesperidum*, *L. hemisphaericum* and *L. oleae*.

The Rose Scale *Diaspis rosae* Sand has been observed on an old rosebush in one place in the city.

Ths Cactus Scale *Diaspis cacti* Comstock is present in one greenhouse in the city.

What appears to be the Pine-apple Scale, *Diaspis bromeliae*, (Kerner) is present in the city on *Latania borbonica*.

The Miner Scale, *Chionaspis*(?) *biclavis*, Comst., has been found on *Achras sapota* in the greenhouse on the university grounds.

One of the Orange Scales, *Parlatoria pergandii*, has been found on an orange plant in the greenhouse on the university grounds.

Several others are being studied, but their specific determination has not yet been made out.

HANGING BASKET AND WINDOW BOXES.

BY C. K. WILSON.

In making my report on hanging baskets, window boxes and yard or cemetery vases, I will say a great deal depends upon the soil, drainage and the water receptacle. The soil should be two parts clay loam, one part sand, one part black loam and one part well rotted barn yard manure. The wire baskets do not need drainage, but the window boxes should be perforated in the bottom, and have a layer of broken pots or gravel in the bottom of the box before the soil is put in. Do not fill the box, basket or vase too full, or the water will run off before it can penetrate the soil.

Before buying a vase see that it has a basin or receptacle for water. The vase should have a hole in the bottom, large enough to put in quite a bunch of sphagnum, excelsior, sponge or cotton to act as a feeder or siphon to draw up the water into the soil.

The best plants to put into the baskets, boxes and vases are dracænas, *Vinca variegata* and *harrisonii*, lobelia, white and blue trailing varieties, trailing queen fuchsia, nasturtium, tradescantia of different kinds, strawberry geranium, stone crop, *Nepeta glechoma variegata*, nierembergia, geraniums, black prince fuchsia, loasa, thunbergia, sweet alyssum, abutilons, especially the trailing one with yellow and green leaves, and Souvenir de Bonne, a lovely one with leaves edged with white, achyranthes in various colors, coleus, white and blue ageratums, *Peristrophe angustifolia*, white and pink Mexican primroses, petunias of different shades, lotus, torenia, *Cobæa scandens*, othonna, cuphea, gazania, mesembryanthemums, and I might mention many more. Sansevieras and cannas are desirable for center plants in large vases.

F. Hunt.

June and September, 1896.

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of
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Columbus Horticultural Society.

QUARTERLY JOURNAL OF PROCEEDINGS.

VOL. XI. COLUMBUS, O., JUNE and SEPTEMBER. Nos. 2 and 3.

PROCEEDINGS OF THE SOCIETY.

APRIL.

A pleasant and profitable meeting of the Columbus Horticultural Society was held at the Ohio State University, Saturday, April 25. Prof. Wm. R. Lazenby was the presiding officer.

At this meeting Mr. Geo. T. Spahr became a member of the Society by the unanimous vote of those present.

Prof. Wm. R. Lazenby reported on the weather of the month as follows: The highest temperature of the month, so far, came on the 18th, when the thermometer reached 89 degrees. The lowest temperature of 23 degrees appeared on the 3d. Range of temperature for the month was 66 degrees. The greatest daily range, 39 degrees, was on the 11th. Mean average temperature for the month 57.60 degrees. Rain fell upon eleven different days. Total rainfall for the month, 2.59 inches.

Prof. D. S. Kellicott gave an interesting report on Entomology. This is given in full on another page of this number.

The Society were then entertained by Mr. E. C. Green, who read a paper on "Crossing Tomatoes," and by Prof. Lazenby, who gave very interesting notes on "Arbor Day."

There being no further business, the Society adjourned.

JUNE.

As the regular date for the May meeting of the Society came on Decoration Day, a postponed meeting was held June 5, at the beautiful home of O. W. Aldrich, near Clintonville.

At this meeting D. S. Barber, of Castalia, became a member of the Society, and A. W. Livingston was elected to honorary membership.

F. P. Dill, of Westerville, reported that canker worms were very injurious in his locality, and that he satisfactorily prevented their ravages by spraying with the following mixture: Paris-green, 12 ounces; water, 45 gallons; soft soap, 3 pints. He said that these worms had done a great deal of injury in the locality of Westerville this season and some had not met with success in spraying for them, because of not using a mixture containing sufficient poison.

Mrs. O. W. Aldrich reported that her roses had almost been defoliated the present season by slugs. She said the flowers did not seem to be lessened in size this year on account of injury to the leaves, but thought that small flowers might be the result next season.

Mrs. Laughlin reported that sow-bugs were injurious to young verbenas. She said that she had lost a dozen or more in a single night. It was also reported that sow-bugs had been reported injurious to beans just coming up.

Prof. Lazenby, in reporting upon meteorology, said that the weather of May had not presented any remarkable or unusual conditions. The highest temperature of the month was on the 9th, 10th and 11, the maximum for each of these 3 days being 91 degrees. The lowest temperature of the month was on the 6th, when the minimum thermometer registered 45 degrees. The range of temperature for the month was 46 degrees. The greatest daily range was on the 9th, a difference between 91 degrees, the maximum, and 54 degrees, the minimum, or 37 degrees. Rain fell upon 15 different days during the month. Total rainfall for month, 2.41 inches, which shows a deficiency of 2.29 inches for the month of May. The rain, however, was so well distributed throughout the month that there was little or no lack of moisture.

Dr. O. W. Aldrich gave an extended report on fruits. He predicted that the apple crop would be behind the average in yield, although some varieties gave promise of good results. He said that pears would be a poor crop, but American and Japanese plums would, in all probability, yield abundantly. He named Abundance, Ogon and Burbank, all Japanese plums, as being especially promising.

F. P. Dill reported a fine crop of early apples especially, in his orchard.

W. R. Beattie spoke regarding the merits of Campbell's early grape. He claims for it earliness, productiveness and fine flavor.

J. H. Lageman gave a few remarks on observations he had made on weeds in the city. He said the Canada thistle is becoming too abundant, and urged that everyone use more care in keeping noxious weeds under control.

E. S. Tussing spoke of the abundance of potato beetles the present season, and reported that he had had success in combatting them with the usual formula of Paris-green and water. Mr. Tussing spoke regarding strawberries as follows :

Louisa, a variety which originated in the South, has perfect flowers, but is too late to plant with Haverland. It comes as near being sweet as any I have tasted, but is a shy bearer.

" Timbrel does not impress me as a berry profitable for culture on my soil. Haverland is the berry I plant most, and am well satisfied with its productiveness. I use Lovett, as a perfect flowering variety, to plant with it. Warfield I like quite well ; Bubach is a shy bearer and very unprofitable with me.

" Michael's early will do for early, but not profitable to raise in quantity. Crescent I still retain and don't think I shall discard it."

Mr. Tussing then passed a basket of strawberries of different varieties to be tested as to flavor.

Prof. Lazenby said that Crescent, Bubach and Haverland were varieties which had gained reputations in many places, but at present newer sorts were replacing them to some extent.

E. S. Tussing said that Haverland produces too small berries and Bubach is not productive.

Dr. Aldrich said that Bubach is not productive on his ground.

U. G. Swingle passed a couple of baskets of fine Haverlands for inspection, and said that he could report a good crop of that variety this season. Those presented were from the last picking.

E. C. Green said that he did not regard Louisa as a promising strawberry, but that Brandywine gave evidence of a desirable variety to cultivate in the future.

Prof. Lazenby then asked if anyone had grown the Sharpless this season.

J. Wetherel, of Camp Chase, said that he had grown a few and considered them very satisfactory. He made the further statement that the Parker Earle is the most productive variety he had grown.

James Miller said that he had grown Greenville and Butterwood this season. The latter ripen about with the Haverland. He said of Cresent : " I don't consider them a profitable sort."

There being no further business, the Society adjourned to the valuable orchard, which is the pride of its owner, Dr. O W. Aldrich. Here we saw cherries, plums, apples, gooseberries.

currants and a number of other fruits. Cherries were most interesting as they were ripe at the time. A great number of the varieties gnowing there, many of the members had never seen fruiting before. Dr. Aldrich pointed out each variety and gave its merits and demerits, and, on the whole, made the time spent in the orchard intensely interesting and instructive.

After spending as much time as possible among the fruit trees, the members were invited into the dining room, where Mrs. Dr. Aldrich and other ladies of the Society, had prepared a quantity of strawberries. Everyone enjoyed the repast and, when it was over, departed for their homes feeling that the afternoon had been well spent.

Dr. and Mrs. Aldrich have entertained the Columbus Horticultural Society more than once, and every time a pleasant meeting has been the result.

SEPTEMBER.

The Society met in Horticultural Hall, Ohio State University, September 26, 1896. President Lazenby presided.

The name of W. R. Beattie was proposed for membership at this meeting. He was unanimously elected.

Professor T. F. Hunt spoke regarding the unusual abundance of crab grass in the lawns about the city this season. Heavy rains have probably caused it to grow so profusely. It presents such a variety of growth that some have suggested that there are three species. It is not probable that there are more than one.

Prof. Lazenby said that certain treatment of a lawn might stimulate the growth of crab grass. He did not think it necessary to root this weed out, as it probably would not appear next season.

The Secretary announced that the harlequin cabbage bug *Mergantia histrionica*, had been collected in Licking County by Prof. Kellicott. It has been taken at Columbus also, feeding on different species of mustard. When this insect was first reported from Texas, the supposition was that it would always remain a southern species. It has been a serious pest in Southern Ohio this summer and specimens have been received by your Secretary from Medina County, with the report that they were injuring turnips.

Prof. Hunt reported that chinch bugs were quite numerous on the University farm at one time this season. They were plentiful in the wheat, and passed into the edge of the cornfield where they seriously damaged a strip a couple of rods wide. He said that furrows were plowed along the corn but no good resulted from it so far as he could observe. All at once the bugs seemed to disappear, and not as much damage was done as was expected at one time.

J. H. Lageman spoke of the abundance of mosquitoes the past summer. He said he had never seen them so annoying in Columbus.

Mr. Streeper called the attention of the Society to some fine specimens of fruit of his own production. The Heath cling peach, the Witt grape, the Pondorosa tomato, and five seedling peaches from the Smock, were all fine examples. Mr. Streeper exhibited one peach which he claimed would come true from seed.

Prof. Lazenby said that if all fruit was able to produce its kind from seed, we would have more healthy trees, shrubs and vines. He thought that such a state of things might be comparatively easy to accomplish in some varieties.

Prof. Hunt—If you had room for ten peach trees, would you raise them from pits or buy the budded trees of nurserymen ?

Prof. Lazenby—At the present time I think better saisfaction would be received if budded trees were procured. There are no well marked varieties now existing, that are absolutely known to produce their kind continually from pits.

W. R. Beattie has our thanks for furnishing some fine plants for decoration. He made a few remarks regarding *Acalypha*, a foliage plant answering the purpose of colias. A specimen of colias was interesting in that it produced a branch that appeared to show the character of its original stock to perfection. The silk oak and a fine abutilon were other plants mentioned in particular.

Prof. Lazenby referred to two fine bouquets of gladioluses from President Cushman, of the State Society. Mr. Cushman raises these plants on a large scale. He sows the seed with a grain drill, and plants the bulbs with a potato planter.

Thirteen varieties of grapes, from Mr. Cushman's vineyard, were exhibited and commented upon by Prof. Lazenby. Empire State, Pocklington and Niagara made a fine plate of white fruit. Witt, a sample of which was on the table, originated with Mr. Witt, a former member of the Columbus Horticultural Society. Salem and Wilder originated from a cross between American and European varieties. They have the "foxy taste" of their foreign parents quite largely, but are not prolific sorts. Catawba, Woodruff Red, Brighton, Delaware, Concord, Worden and Nectar were the other varieties exhibited.

A seedling peach, grown on the grounds of Prof. Derby, was placed on the exhibition table by Mr. J. J. Janney.

The regular program consisted of a paper by Prof. Wm. R. Lazenby on "Horticulture and Health," and one by James S. Hine entitled, "Notes on the Army Worm."

A letter from Prof. E. E. Bogue, of Stillwater, Oklahoma, was read by the President. Mr. Bogue reports progress in his new field of work, and is interested in the horticultural products of the western country.

The Secretary presented a bill of $64.00 from Spahr & Glenn. This was ordered paid.

The Society then adjourned.

JAMES S. HINE, *Secretary.*

THE EDITOR'S TABLE.

DURING the past summer a handsome volume of nearly 600 pages on the notorious "Gypsy Moth," has appeared. This volume is by C. H. Fernald and E. H. Forbush, and contains a report of the work of destroying the insect in Massachusetts, together with an account of its life history and habits, both in this country and across the Atlantic. The "Gypsy Moth" first appeared in Massachusetts in 1868 or 1869. For ten years it was not observed by anyone but the introducer. In 1890 the first Gypsy Moth Commission was appointed and work immediately began. This commission has worked faithfully and has reached some good results. The insect is not exterminated it is true; but there seems every reason to hope, judging from what has been done and the behavior of the species in other countries where it was once alarmingly abundant, that this is possible if money be supplied and it be given at the time when it can be used to the best advantage. The effect of spraying with Paris-green mixture of ordinary strength was quite unsatisfactory. The natural enemies of the species were studied in detail, and measures practiced for destroying the pest in its different stages.

MANY of the local Horticultural Societies of the State hold their meetings at the homes of their members. As examples of this Miami and Muskingum County Societies might be mentioned. A historical sketch of the former appeared in the *Ohio Farmer* some weeks ago. A reproduction of a photograph of the Society in session, showed that at least one hundred persons were in attendance. When a Society can attract people in such numbers it is surely making its influence felt.

BRITISH LOCAL WEIGHTS AND MEASURES—In Wolverhampton, apples appear to be sold by the pot, and a pot weighs 75 pounds, but in Warwickshire, which is not very far away, a pot only weighs 40 pounds, though in the latter case it would appear that only peas and beans are measured by this standard. The curious may wonder if a pot of apples weighs 75 pounds in Wolverhampton, what might be the measure of a pot of pears in Gloucestershire. In Cornwall, a bushel of corn equals 240 pounds, whereas in Sunderland, a bushel only weighs 46 pounds, and in Hereford, 63 pounds. Why, again, is a stone of live meat equal to 14 pounds, and a stone of dead meat to 8 pounds? Strawberries are sold by the "punnet" in Greenock, while fruit in Forfar is sold by the Scotch pint. The Scotch pint, by the way, generally equals three of the Imperial pints, but in Dumfreisshire a Scotch pint equals four Imperial pints. Vegetables in Northamptonshire are sold by the "mollies," which vary from 12 to 40 pounds. In Cambridgeborrough it is by the yard that butter is sold. One would think that the same measure should be used in measuring wheat, barley and oats, but in Buteshire a boll of wheat equals 240 pounds, and a boll of barley equals 320 pounds, while a boll of oats in Argyleshire equals six bushels. In Flintshire a "hobbet" of old potatoes weighs 200 pounds, and a "hobbet" of new potatoes 210. A peck of potatoes in Gloucester equals 14 pounds, a peck of potatoes heaped in Gloucester equals 16 pounds.—*Manufacturer.*

STATISTICS show that the world's silk production, for 1893, was estimated at 30,148,000 pounds, showing a steady increase since 1889. That year the approximate production was 25,000,000 pounds; in 1891, 26,800,000 pounds, and in 1892, 27,800,000. In 1893, China is credited with 10,000,000 pounds, Italy 8,800,000. Japan nearly 6,000,000 pounds.

A GREAT many fine seedling peaches have been produced this season. The abundant crop of this fruit over large areas is an explanation. Many seedlings have seemed worthy of a name, and some have been named, but it is doubtful if many or even any will survive to cope with the scores of tested varieties in existence at the present time. It seems that there are early, late and medium varieties, cling and free-stones, to meet all requirements. If a new variety does not have a particular desirable quality it is not readily introduced.

REPORT OF COMMITTEE ON EMTOMOLOGY.

BY PROF. D. S. KELLICOTT.

I. *Rose-scale.*

Mr. Tusing reported at the last meeting a scale on canes of black raspberry. These prove to be the Rose scale, *Diaspis roseæ.* Comstock and Smith have reported it as occurring on the blackberry and raspberry.

The remedy is severe cutting back, burning the brush and spraying the canes with whale oil soap solution, not too concentrated—one pound in three or four gallons of water; or diluted kerosene emulsion applied soon after young appear, in May or June.

Mr. Hine has found the scale in the University gardens.

II. *The clover-leaf Beetle.*

Attention was called to this beetle about Columbus last year. It is everywhere about the farm this spring, and doing a considerable damage. The specimens shown in the breeding cage are average samples from an infested field.

Last year the fungus attacked the larvae in northern Ohio and greatly reduced them. The rains of the past week and warm weather may encourage the fungus. This natural remedy and plowing up the clover are about all the effective remedies thus far found out.

III. *The remedial Toad.*

There came to the O. S. U. Zoological Laboratory, the other day, a toad of full habit, shining eyes and general well-kept appearance. In the course of events the stomach was exposed and found to be distended. Examination of its contents disclosed the following as articles of its last full meal ; probably the result of a night's "fishing" :

1.	Common angleworms	18
2.	Myriapods(*Julus*)	3
3.	Cricket	1
4.	Cut worms	22
5.	Clover-leaf beetle (*Phytonomus punctatus*)	2
6.	Ground betles :	
	Calosoma calidum	4
	Evarthrus sodalis	2
	Pterostychus stygicus	2
	Harpalus herbivagus	1
	Total	55

Of these animals sacrificed to the gluttony of one larger than they, the cut worms and the clover-leaf beetles only may be said to be destructive to crops ; on the whole, most of them are rather useful than otherwise. In fact the larvæ of the ground beetles are destroyers of the larvæ of other insects. Still if *Bufo* will so readily take to a diet of cutworm, he should, by all means, be encouraged about the gardens and fields by kind treatment and by having ponds at convenient distances in which his tadpoles may grow until they get hopping legs.

JUNE REPORT ON VEGETABLES.

BY H. WARREN PHELPS, WESTERVILLE, O.

This year has been one of remarkable growth of vegetation. We had no weather so low in temperature, after April 10, to seriously retard growth of vegetation. Farmers were delighted as the winter was very severe on their depleted pocketbooks, after the terrible drouth of the summer of 1895.

Corn and potatoes which were planted April 10 to 20, came up well and have grown well since ; therefore, there are many small fields of potatoes which have a plentiful supply of large tubers. Vines are vigorous. But, very many farmers delayed planting until May, having lost early planting last year by frost.

The acreage planted to potatoes is not so large as it was in 1885. The Colorado beetle has been and is now very plentiful and busy ; spraying and picking off have thined them out.

Gardens generally are very forward. Peas, lettuce, beets, radishes, beans and all other vegetables are in plentiful supply.

More than the usual acreage has been planted. Cabbage and tomato plants for late crops have been put out more than ever before. Farmers and gardeners have planted freely of the seeds sent out by the Department of Agriculture at Washington through the congressmen and Weather Bureau officers, and the fine growing season has brought the plants up nicely.

Pumpkin, squash and cucumber vines, also melons, have grown well. Bugs have been somewhat troublesome. Many preventatives and remedies have been used, some with success, but the season having been favorable to growth the vines have kept vigorous.

I have one vine of the Maltese pumpkin. From the six seeds received and planted, only the one sprouted. These seeds I received from a gentleman in New York, who got the original seed in the Island of Malta in 1894.

It would seem that no family who can get employment need be short of vegetables this season. Farmers are not hiring very much labor. The average farmer has no extra supply of money, therefore, there are very many nearly idle men, who live in the country. They have better gardens than usual this year. Those persons are depending more upon the products of their gardens than on the results of their labors elsewhere.

JUNE REPORT ON FRUITS.

BY H. WARREN PHELPS, WESTERVILLE, O.

Strawberries were not very plentiful. Growers got careless and did not take proper care of the plants, did not cover them well generally, and the plants wintered very badly after the very severe drouth of 1895, which was never so great here previously. However, those who did care for the plants during the great drouth, and then covered them well with straw or leaves of trees, are amply repaid in having very fine lucious berries and plenty of them, and they were in great demand at good prices.

Currants were very plentiful and large, mostly Fays, very few white varieties ; but, where well cared for, the berries were fine. The currant worm can be destroyed and the people have found it out, yet there are very many farmers who will not set out currant bushes.

Cherries were the finest ever known. Wherever there was a tree that had had a half chance to grow and mature fruit, it was well laden with perfect fruit.

Raspberries are very fiine. Many of the canes were winter killed, where not well cared for during the summer of 1895.

Gooseberries are in great supply. Every bush, where half care was taken, is well laden with fruit of fine quality.

Blackberries promise a fair yield.

Pear trees are well laden with fine, fair specimens of fruit.

Peaches—well, the trees are breaking down, the fruit is so very plentiful; nearly all trees are propped up. Some of the early varieties are now ripening, and the fruit is fair, and rich in quality; not so large, however, as they would have been had the fruit been thinned out early.

Apricots are looking fine; nearly every tree is bearing plentifully.

Grape vines have come out very vigorous. The clusters of grapes are very plentiful. On some of the vines the grapes are not set in such plentiful supply as in other years, but the fruit is larger as a result.

The quince has set well and the fruit is fair.

Plums—well, nearly every tree is so full of fruit that the limbs are being propped up except where the fruit is being thinned out by picking off. Some varieties which have not borne fruit here have specimens on now. The curculio has not stung very much of the fruit.

The apple has not fared so well. A number of orchards lost their entire foliage and fruit from the ravages of the black web-worm. I do not know of an orchard having been sprayed where the worms were working; therefore, do not know what kind of amixture of poison would be effectual. In several orchards where there was no evidence of the existence of worms the trees were sprayed.

Not all trees have fruited this year, but in very many orchards where there was no fruit or very little last season, there is a plentiful supply of apples, and generally fair and good sized. The crop is more evenly distributed than it was last year.

There will be a plentiful supply of all fruits. Very many farmers have not planted out fruit trees and vines, but more of them are each year seeing the great advantage of having fruits, and they are giving orders for trees, vines, canes and plants.

The very many farms passing into the hands of the few wealthy men causes more tenants; therefore, many farms have less fruit trees than formerly.

COMMUNICATIONS AND DISCUSSIONS.

TOMATO CROSSING.

BY E. C. GREEN.

In the winter of 1893-94, I had in the greenhouse the following varieties of tomatoes: Dwarf Champion, Potato Leaf, Prelude, Ponderosa, Golden Ball, Golden Peach, Rose Peach, Beauty and Acme.

I thought at first that I would make crosses of all of them, but after trying a while I found that my number of crosses would increase in an alarming ratio, so contented myself with making about thirty. I had found from previous work that it was something that could not be done all at once, so by attending to it regularly every day for three or four weeks, I had the pleasure of seeing fruit on nearly every variety that I tried. But, when I came to gather the seed I found that I did not always get seed. I found one large sized Ponderosa crossed with the Golden Ball that had not a seed in it. I have but little doubt that a seedless tomato can be procured, for I had one for two years that was about the size of a good sized cherry that produced no seed at all.

My experience with these crosses lead me to the opinion that they may be divided into two classes. First, the practical crosses, second, the curiosity crosses.

A practical cross is one between varieties that are good, but from different strains, and near enough alike so they are not liable to sport back into original forms. A cross between the Beauty and Acme I do not think liable to sport, and I think it a possibility that we may add something of the good qualities of one to that of the other. If something of the earliness of the Acme could be added to the general good qualities of the Beauty, a desirable point would be gained. I made such a cross, and the second year the tomatoes were large and fine, but as to their earliness I could not say.

My experience leads me to think that the Dwarf Champion crosses will come within the practical crosses. A cross between the Dwarf Champion and the Ponderosa gave me some of the finest and largest tomatoes in my whole lot, but I think that they will be more liable to sport than some others. I believe I am safe in saying that with time and patience almost any variety may be dwarfed. I had the Ponderosa fruit on dwrarf vines; also yellow dwarf and red dwarf by the dozen. Also a dwarf Potato Leaf.

Just where I draw the line butween the practical crosses and the curiosity crosses is very hard to say, but I think if we take varieties that are best we may add something, for the tomato, left to itself, is self-fertilizing and that has been found not to be best in plants.

Of the curiosity crosses, I think we may include those that are as far apart as is possible to have them and still make the crosses. Under these circumstances it is probable there will be an almost universal tendancy to sport and run back into the original form.

The different crosses between the Peach tomatoes gave me some odd forms, but sported badly and were only interesting. Those of the Golden Ball were scarcely less interesting and no more valuable.

Of the many crosses the breaking up did not occur the first year, but in the second.

The cross between Dwarf Champion and Potato Leaf resembled neither the first year, but was more like the common tomato; but the second year sported into three forms. The only difference in foliage the first year was in a cross between the Dwarf Champion and Golden Ball, but the second year all differed entirely from those of the first.

Perhaps the most valuable lesson learned in these curiosity crosses, was to learn something of the original form and color of the tomato. Red seems to be the original color, for a cross between two purple kinds gave me a red tomato in three different cases.

Mr. A. W. Livingston, in his Tomato Book, speaks rather disparagingly of crossing the tomato to produce anything of value, but his plan has been by selection and cultivation. Now I believe that Mr. Livingston is right, for no man ever better proved he was in the right than he has, in the almost incalculable value of the tomato Mr. Livingston has given to the world; yet, before we can make our selections we must have something to select from, and crossing I am sure will give us that. I once asked Mr. Livingston where he obtained the Dwarf Aristocrat, and he said that it was found in a field of Dwarf Champions. "How did it get there?" I am inclined to think it a cross between some of the better red sorts, such as the Stone, and the Dwarf, for I have produced, as I said before, red Dwarf by the dozens in this way. I was always sorry that I did not use the better red varieties on the Dwarf.

Luther Burbank, that wonderful wizard of Horticulture, of California, says, in one of his catalogues, that he has made more of an advance in berries (mostly by crossing), in the last fifteen years than was made 1800 years previous.

No doubt Mr. Burbank has done a wonderful work, but when we remember that he has had the advance made by others, we cannot see how he has advanced only a step. Of the grapes produced by T. V. Munson, of Texas, Jacob Romel says that they are worth more than all others that have been introduced ; but he has started where others left off. So it is with tomatoes. If by crossing we can get new and better forms to select from, then by patience and perseverance fix these forms, we may be able to advance a short step.

NOTES ON TORNADOES.

BY PROF. W. R. LAZENBY.

Just at this time there is no subject connected with meteorology of such absorbing interest as that of tornadoes.

The terribly destructive wind storms of the past month have often been called cyclones, but this is a mistake.

A *cyclone* is a rotary storm, or *whirlwind of extended circuit.*

A *tornado* is a violent rush of wind, distinguished by both a whirling and progressive motion. It is usually accompanied with thunder, lightning and rain. It is commonly of short duration and small breadth. It is sometimes called a hurricane, but not a whirlwind.

Although much has been written about tornadoes, the truth is we know little about them. They come so quickly, and are accompanied by such terrifying manifestations, and observers are in such fear for their lives, that they are totally unfitted to give any account of what they have seen. For some time after the tornado is passed every one is absorbed in the destructive effects, and little or no note is taken of the real atmospheric conditions. After a while people begin to talk of what they have seen, but the accounts are so contradictory that some of the observers are evidently troubled with a creative imagination and addicted to long flights of fancy into the realms of the impossible.

It has come to be generally admitted by those capable of passing judgment, that tornadoes and thunder storms are closely allied, each resulting from the same general causes.

In fact *tornadoes* may be regarded as *intensified thunder storms.*

Some of the more general facts regarding tornadoes may be cited as follows:

(1.) *As to time and place.*

Tornadoes rarely occur except durnig the hotter portion of the year—say from May 1st to September 1st. They are most frequent upon inland plains. They seldom occur singly, quite a number being developed over an extended region from 500 to 800 miles in length and breadth.

The most marked atmospheric feature immediately preceding a tornado is a still, warm and sultry air. Although the sky may be clouded the air is oppressive, the heat being quite different in effect from that of the sun's rays.

Among the first warnings, after the appearance of dark and threatening clouds in the west, is a peculiar lurid or greenish tinge in the sky, usually extending from the south to the west. This characteristic feature is termed the "tornado sky," and to those who are observing will serve as a warning for the serious results which soon follow. Another warning is the funnel shaped cloud. The shape and peculiar appearance of the cloud is not of much value as a warning signal, for, as a rule, it is not seen until it is just upon the observer. This is due to the enormous cloud of dust directly in front, which often rises to a great height.

Another indication of the near and certain approach of a tornado is an indescribable roar. This roar is undoubtedly a marked electrical phenomenon—something like a continuous roar, or rumble, of thunder. I called it indescribable, but it has been likened to the bellowing of a million mad bulls, the roar of ten thousand trains of cars, etc.

These warning sights and sounds are now followed by the funnel cloud itself, which bursts into view like a great balloon, with a long neck which it sweeps round and round with terrible fury, destroying everything in its path. One observer has likened it to an enormous elephant's trunk, whirling with almost incredible velocity in its mad career, with a motion back and forth, sometimes leaving the earth a moment, then bounding back to continue its work of destruction.

The destructive period of a tornado at any one point rarely occupies more than three or four minutes, but within this short period the strongest brick and stone structures have been demolished, and death and ruin left in its wake.

Tornadoes almost invariably move toward the northeast. The width of the destructive path may reach a thousand feet, although it is usually less than five hundred.

In a very few minutes after the passage of a tornado a clear sky, with sunshine or stars, appears. This shows the exceedingly circumscribed nature of the tornado.

The destructive force of a tornado is not due to the direct onward motion of the storm, for this is comparatively slow. It is the whirling motion that is the cause of the destruction. Just what the maximum velocity is, is not known. It has been estimated at 500 miles an hour. This is probably much above the mark. (Illustration from Washington C. H.) In 1878, at Wallingford, Conn., a tornado blew down a number of monuments in a cemetery, which lay in its path. In one case a stone 2 ft. long, 2 ft. thick and 4 ft. long was blown out of place without the slightest chipping of the upper or lower stone. The weight of this stone was known, and it was estimated that it would require a wind moving at a velocity of 260 miles an hour to blow it off.

In conclusion, it may be said that although many careful observers are at work, we still know little or nothing concerning the real mechanism or physics of the torando. We may never be able to guard ourselves fully against its devastations, yet I have an abiding faith that our weather service will yet be so perfected as to give such warnings that many now exposed will be able to protect themselves.

THE COMMON MYRTLE.

Myrtus communis.

BY J. H. LAGEMAN.

The common myrtle is an evergreen bush from three to eight feet high, with smooth, ovate or lanceolate, opposite, shining leaves, and sometimes with two bristle-like stipules. The flowers are white, usually single, sometimes in twos, stamens free, and berry as large as a pea, with several kidney-shaped seeds.

The myrtle belongs to *Myrtaceæ*, which includes the clove, iron-wood and eucalyptus. It grows in Portugal and all countries around the Mediterranean Sea. It came from Greece to Italy and Germany and is at present a well-known house plant.

There are different kinds of myrtle, namely, the fine leaved and the large leaved. The latter often changing into a form with verticillate instead of opposite leaves, and is called the Jewish myrtle because it is very much loved and cultivated by the Israelites.

Branches from the myrtle are used for bridal-crowns and wreaths as an attribution of virginity. and as the emblem of beauty and youth. In olden times it was dedicated to Venus Aphrodite, who, diving out of the foaming ocean, hid herself behind the myrtle bush. The ancient priests of Elensis, in Greece, wore myrtle crowns.

Myrtle berries steeped in wine is a good remedy for a weak stomach and is also used for cholera infantum. According to Apicius' *Art of Roman Cooking*, myrtle berries were used for pepper when the latter was unknown. Out of the flowers the celebrated Angel-water was distilled. The myrtle is very easily raised from cuttings, but it is difficult to get it to blossom.

JUGLANDACEAE.

BY J. HAYES BONE.

The family of plants bearing this name contains only large sized trees. The leaves are pinnate, alternate, exstipulate and the flowers are monoecious. The fruit is a tryma or dryish drupe with a fibrous epicarp, or shuck. This shuck may be fleshy as in the walnut, or woody as in the hickory nut. There is a bony epicarp or shell in which is lodged a large seed with oily, lobed cotyledons. This seed is very wholesome in most of the species. In Europe the English walnut, *Juglans regia*, is largely cultivated for the edible seed.

The fruit or seed yields a rich oil. The epicarp, leaves and bark are astringent. The most valuable product of this family is the lumber it furnishes. The wood of our two species, *Juglans cinerea* and *nigra*, are used in an ornamental way. They furnish veneering material, timber for cabinet work and finer inside finishing. The wood of *nigra* is very durable in contact with soil and the rougher parts of the tree are generally used for posts.

While *Juglans* furnish us with ornamental woods, the genus *Carya*, or hickory, gives the strong useful woods. The woods of this genus are heavy, ranging from 44.39 pounds per cubic foot in the bitter-nut to 51.56 pounds in the pignut. They are used largely where strength is required, as in the manufacture of carriages and wagons, plow-beams and the like. Walnut wood is comparatively strong but brittle, while that of hickory is strong and elastic.

A comparison of these woods as shown by a few experiments, might be interesting. As to weight of our woods of Ohio, we find that there is a variation from a little over 20 pounds per cubic foot in the arbor vitæ to something over 55 pounds in the yellow oak. If we call those heavy woods whose specific gravity is over one-half, and those light woods whose specific gravity is under this figure, or whose weight is less than 31.2 pounds per cubic foot, we have in a list of 63 of the most prominent woods of Ohio, 42 that may be called heavy and 21 that may be called light woods. In the family of Juglandaceæ we find one light wood, the butternut, having a weight of 26.57 pounds per cubic foot. The black walnut weighs 32.92 pounds.

The following figures give the weights of a cubic foot of seven of this family, and the percentage of water absorbed in 24 hours and in three months:

Name.	Weight of cubic feet.	Per cent. water absorbed in 24 hours.	Per cent. in three months.
Butternut	26.57	12.4	69.0
Blackwalnut	32.92	10.9	63.9
Bitter-nut	44.39	15.9	55.4
Mockernut	44.86	11.1	60.5
Shellbark	46.01	12.0	66.8
Kingnut	48.73	13.1	65.9
Pignut	51.56	9.6	53.0

None of these woods are rapid absorbers of moisture in comparison with white pine, which absorbs 41.7 per cent. in the first 24 hours. It is perhaps on account of their density. This does not, however, explain the durability of walnut.

For a shade tree for stock we think the black walnut very good. One objection to its being used for shade is that it sheds its leaves very early and puts them forth very late. The first frost brings them to the ground. By the middle of October its leaves are all gone. Its wide branches cover a great deal of space if allowed to grow in the open field but under this tree is usually found a good coat of grass.

The hickory has an oblong form, tending to grow tall and furnishes but little shade.

I think the walnut prefers bench or bottom land, where it may send its tap root into the deep soil. In a hilly country, like Southern Ohio, you will usually find the hickory growing on high ground and most abundant on limestone soil.

As to the general distribution of the members of this family we may say there are four genera and thirty species. Twelve or thirteen species are found in the United States. Eight are found in Ohio. The butternut and pignut are found in Canada and most of the United States. The other species, natives of Ohio, walnut, shellbark, kingnut, mockernut, small-fruited hickory and bitternut, are found in the eastern, middle and southern states. They are more abundant toward the south.

THE "ARMY WORM."

Leucenia unipuncta.

BY JAMES S. HINE.

As I was permitted to observe the destructive habits of the "army worm," the past summer, I take the opportunity at this time to present a few notes regarding it, to the Society.

This insect is present every year, but not usually in destructive numbers. Only twice can I remember of its being seriously destructive in northwestern Ohio. In 1875 the first outbreak of importance occurred. The second during the season just past.

Of the destruction caused by the army worm in 1875 I can say but little from personal observation. From the Third Report of the U. S. Entomological Commission, we learn that Hancock county lost 50 per cent. of the oats crop. "Oats were also badly damaged in Henry, Van Wert, Fulton, Lucas, Mercer and many other counties of the State." Many cut oats that year before they were fully ripe, and some fields and parts of fields were not worth cutting at all. The larvæ passed from one field to another in armies, and were the cause of comment and uneasiness from farmers generally. Many thought corn was destined. But before much damage was done to the latter crop, the worms pupated and their ravages for that season were at an end. Many predicted that they would be more injurious the following season, but, although some were seen, no damage was reported in Fulton county as a result of their work. They do not appear when they are expected and consequently when they do come people are not prepared to combat them.

The summers of 1894 and '95 were notable for continued dry weather. The past season was a very wet one. Consequently meteorological conditions were favorable for an outbreak of the "army worm."

Riley's observations, covering a long period, show conclusively that "army worm" years always follow dry seasons, but the seasons in which the worms appear in destructive numbers do not necessarily have to be wet.

Fitch claims, that in order to have "army worms" abundant, there must be a wet season following a dry season; but Riley cites instances where they were injurious in dry seasons following dry seasons.

During the first days of July it was reported from Williams county and western Fulton that the "army worm" was doing serious injury to oats. This led farmers to make observations, and soon it was known that they threatened destruction over large areas.

When the worms were first observed they were nearly full grown and in condition to do the most damage possible. They began work on the lowest ground, consequently there the oats were damaged most. Their manner of working on oats is one of the most destructive conceivable, as they cut off the pedunkle and let the grain fall to the ground. In some whole fields and parts of fields the grains were eaten off in this way until only the naked straw was left standing.

It was reported that the worms on the march gave some annoyance to bicyclers. On hard roads so many larvae were crushed by riding over them, that the tires became wet and slippery, sometimes causing the rider to fall.

The worms did not stop eating when oats were cut. They congregated in the shocks and continued eating. Wet weather prevented the farmers from stacking as soon as they otherwise would, consequently most of the larvæ had changed to crysalids before oats could be put out of their reach. Many pupated in the shocks, others an inch or so below the surface of the ground, and still others under sticks and stones. When the sheaves were handled many pupæ would drop from them to the ground, so that great numbers could be found near where a shock had stood.

Although all damage, of consequence, was done to oats, the worms were common on a variety of plants, such as tomato, corn, cabbage, grasses and various kinds of weeds.

The moths appeared in abundance during the first days of August. Decaying apples seemed to attract them, for at sundown and after, swarms of the adults were observed flying under apple trees where lay plenty of decayed fruit.

Chickens seemed to have a particular liking for the moths. A brood of half grown chickens were in the habit of roosting near a particular sweet apple tree where these moths flew abundantly every evening. Certain ones of the brood developed a liking for the insects, for they would remain out until it was almost too dark to see them, plainly for no other purpose than to procure what food they could by catching the moths in question.

Regarding the number of larvæ that will appear next year, one can only speak with uncertainty. From past experience it would seem that they are not likely to appear in injurious numbers two years in succession, but as there is no conclusive proof to base a sweeping statement upon, such better not be made.

HORTICULTURE AND HEALTH.

Prepared for the American Association for the Advancement of Science.

BY WILLIAM R. LAZENBY.

I should be lacking in ordinary sensibility did I not appreciate the compliment of being elected Vice-President of Section I of the American Association for the Advancement of Science.

To be called to this office in an association that has for years stood for the scientific thought and scientific progress of this continent,—an association whose list of officers and members has contained the names of some of the most distinguished men and women of our time,—an association whose proceedings are an index of the marvellous advances made by scientific research during the latter half of the nineteenth century,—is truly an honor that any man or woman might covet.

Since accepting the honor, there are two words that have appealed to me with equal force and signal persistency.

These words are *responsibility* and *opportunity.* The former I have tried to discharge in an earnest effort to secure papers, and arrange an equally interesting and profitable program for this sectional meeting, and the latter I try to meet in the address which follows.

This year the title of Section I is changed, and its scope enlarged. It is no longer the Section of Economic Science and Statistics, but the Section of Social and Economic Science.

This change was precipitated by a series of resolutions presented before the Brooklyn meeting of 1894. The purport of the resolution was, that inasmuch as the stated object no less than the true function of the American Association is to promote the advancement of *all science,* including the science of society, it was in duty bound to aid and assist all desirable reforms, to the end that the progress of modern society, by the application of scientific principles and methods, might be advanced, and its perpetuity insured.

At the same meeting an amendment to the Constitution was proposed, which changed the name, as already stated, and so enlarged the field as to include all those branches of knowledge which deal with the political, commercial, economic, and social life of mankind. This amendment was adopted at the Springfield meeting of last year, and we now meet for the first time as a section of social and economic science. Permit me to add, that, in my judgment, the all-inclusive term "social science" would have been sufficient, for the word "economic" only defines a branch of the larger science already named.

We live in an era of reforms. At first, man was a reformer by primal necessity. He transformed or reformed nature to meet his bodily wants. His life was a mere struggle for existence.

In time he turned his eyes inward, and studied himself. He first dimly saw that there were higher ends and nobler purposes than mere sensual enjoyment. He slowly learned that his passions and appetites were created to serve and sustain, not to master and destroy.

Then turning his eyes outward, and scanning his relation to others, he found, not justice, much less love and good will, but necessity on the one hand, and advantage on the other, controlled the dealings of man with man. He met no recognition of the brotherhood of the human race. But progress is a law of our being, and we have now reached a point where ethical laws are being applied to practical life.

To this end are the various special reforms of this day and generation mainly directed. There are reforms in church and state polity, reforms in municipal government, educational reforms, prison reforms, dress reforms, reforms in eating and drinking, and numerous other special reform movements, which challenge our attention.

What the true, genuine reform spirit of our age is seeking to establish is the equality of human rights ; an equality that disregards all disparities of race, sex, or color, of strength, knowledge, or creed ; an equality that is plainly and tersely expressed in the Declaration of Independence :

> "We hold these truths to be self-evident : that all men are created equal ; that they are endowed by their Creator with certain unalienable rights ; that among these are life, liberty, and the pursuit of happiness."

As a people we may be selfish, short-sighted, and sinful, yet there is a strong undercurrent of moral obligation to live for the highest good of humanity, and to co-operate with that "power which makes for righteousness."

Through all the folly and evils of our time there comes to every discerning ear a voice which speaks to us in no uncertain tone. Its message is this: teach the child and you will not be obliged to hang the man; find the vagrant orphan a home, and teach him a useful trade, and you will not have to punish him as a thief, or watch him as a criminal; furnish work to all who need it, and there will be few to support as tramps, paupers, and parasites; remove temptation from the path of the weak, and you will not be obliged to punish them for having stumbled and fallen; it is better to counsel than to condemn,—better to lift up than to crush down,—better to be shielded by love and gratitude than to be protected by soldiers and police. Thus testifies the moral genius of our age. Let us try to understand and heed it.

The great, all-embracing reform of our age and country, one that naturally follows the banishment of human chattelhood from our soil,—one that is palpably demanded by every instinct of justice and humanity,—is that which will lift the industrial classes from the plane of servility to one of self-respect, self-guidance, and independence. Its object is to lift the laborer, not out of labor, but out of ignorance, inefficiency, and want. This great end cannot be attained at once, but the development of a truer and more profound social and economic science should help to pave the way.

The socialist has his dream of an ideal world. He believes it possible to have a social and industrial order, wherein all freely serve, and all are served in return; where no drones or sensualists can abide; where education is as free and common as air and sunshine, where nothing but service secures approbation, and nothing but merit wins esteem; where mental development and moral culture is the aim, as well as possible attainment of all. Is such an order possible? What says social science?

It may be well to repeat here the question discussed by Vice-President Fernow at the last meeting of this Section.

Have we a social and economic science? Have we enough observations, facts, laws, principles, subservient to social and economic conditions,—so well aranged and classified as to warrant the use of the term *science?* I believe we have. Let me not be misunderstood. I am not a teacher of such science. I rank low in the class of learners. What I know of science as applicable to society and economics is slight indeed. Yet I know there is such a science, and I believe that each succeeding year enlarges, improves, and perfects it.

If some of the recent applications of this science appear shallow and seem almost to partake of the nature of quackery, this should not bar the way to our advance to the acquisition and development of a true social and economic science, which shall be neither shallow nor empirical.

In this spirit, and with no little hesitation, I present a few thoughts on "Horticulture and Health."

Ours is an eminently practical age. The energy of our people is mainly expended in the production, manufacture, and distribution of articles that nourish the body, gratify the senses, or in some way contribute to the comfort and convenience of mankind.

Mind is steadily dominating matter, and this extension of the sovereignty of man over the material forces of the earth we call civilization.

The art of horticulture consists primarily in transforming by means of cultivation, crude and worthless materials into substances valuable as food products, or useful in ministering to our love of the beautiful. This raw material is furnished by the soil, and such substances as may be added thereto, together with certain elements of the air.

Etymologically speaking, *horticulture* means the cultivation of a garden. The real scope of this definition depends upon the meaning of the word *garden*. According to philology, this word comes directly from the Anglo-Saxon *gyrdan*, to enclose. It is the root of the verb *to gird*, meaning to encircle.

Gardening and horticulture, like farming and agriculture, are synonymous terms. We should remember, however, that the full scope of the meaning of a word is not determined by its derivation. This must be sought in its general use and common application. By this standard horticulture readily separates itself into four great divisions, each of which may be many times subdivided.

These principal divisions are:

I. Pomology, or fruit culture.
II. Olericulture, or vegetable gardening.
III. Floriculture.
IV. Landscape-horticulture.

The first two of the above divisions belong to the realm of industrial or domestic art. The third, floriculture, is both an industrial and a fine art. While the last, landscape-horticulture, lies wholly within the province of fine art.

Horticulture is more than a mere trade. It is more than a productive industry. Its successful practice is based upon great laws which have been deduced from the natural and physical sciences.

Many of these laws may be arrested, modified, or set in motion at will.

The horticulturist, as he learns that the control of these laws is largely in his own hands, becomes an enthusiastic student and investigator, and can scarcely fail to develop a love for rural life,—a love that is deep and abiding. Horticulture may justly rank as a science, as well as an art. Not to speak of the science of the propagation of plants, or the science of tillage, the great fundamental principles of evolution are exemplified in horticulture as nowhere else. Over 6,000 species of plants are cultivated by the horticulturist, and these have produced almost an infinite number of distinct forms.

In these forms, with their wonderful and intricate variations, we can study the laws of genesis, and the master mind of Bailey and others are rapidly reducing the wealth of facts found in greenhouse, garden, and orchard to the semblance of an orderly, systematic, and progressive science. The influence of natural and artificial selection, the effect of soil, climate, and moisture upon development, the transmission of acquired characters, the formation of new species, are revealed in horticulture as in an open book. Here facts take the place of conjecture, and demonstration is substituted for theory.

In discussing the relation that horticulture bears to health, not physical health alone, but intellectual and spiritual health, have been considered. In like manner, the products of horticulture, as well as horticulture as a vocation or recreation, are taken into account. First, let us consider the effects of the use of our common garden and orchard products as a part of an every-day diet.

There is a great deal of talk about health and diet that is equally foolish and hurtful; foolish because it subserves no good end, and hurtful because it tends to fortify the pernicious idea that our bodies are in such wretched condition as to need constant tinkering, and that some sort of self-medication is a positive duty.

Like malaria, this affection is everywhere. How shall it be treated? In the place of this wide-spread delusion there should be an inbuilt conviction that there are certain articles known as foods, in the choice of which and in the quantity used each one has daily opportunity to exercise the virtues of common sense and moderation. But foods are not medicines.

A medicine is something which is taken into the body to produce a certain specific and unusual effect, the object being to counteract some injurious tendency or abnormal state. If taken when not needed, its effect is likely to be directly injurious. In order to maintain strength and vigor, and repair waste, the normally healthy body craves what is *wholesome*, not what is *medicinal.* When a thing has real medicinal value, it is almost certain to be unwholesome as a general article of diet. There is an old tradition,—even now quite generally believed, although gradually fading away,—that anything that affords us simple physical pleasure is dangerous, if not absolutely sinful.

So when one eats freely of fruits, he does not feel justified in simply saying he does so because he finds them agreeable, he likes and craves them, but is constrained to look wise and solemnly observe that "fruits are very healthy." Some even go so far as the German prince, and have for each bodily ailment a different variety of fruit. The prince said, "Whenever I meet with any misfortune or affliction, and am disposed to give way to my grief, I order a young goose nicely roasted, and eat as much thereof as I can: I always find that I rise from the table far less unhappy." Let us banish the idea of making a drug-store of our fruit-gardens and orchards, and cease looking upon the family fruit-basket as a sort of homœopathic pill-box!

"Blessed are they that hunger and thirst," can be said as truly of our bodily wants as of our spiritual necessities: not blessed because they shall be medicated, but because "they shall be filled,"—filled with what tastes good, what gives genuine and lasting pleasure.

In satisfying our hunger for fruit,—fruit that is well matured, juicy, and fine flavored,—we get, perhaps, the highest form of palate gratification with the least possible digestive effort.

Our ordinary fruits contain the following substances in greater or less proportions:

1. A large percentage of *water.*
2. *Sugar*, in the form of grape and fruit sugar.
3. *Free organic acids*, varying slightly according to the kind of fruit. For example, the predominating acid is malic in the apple, tartaric in the grape, citric in the lemon.
4. *Protein or albuminoids*, substances containing nitrogen, which resemble white of eggs, and are equivalent in food value.
5. *Pectose*, the substance which gives firmness to fruit, and which upon boiling yields various fruit jellies.
6. *Cellulose or vegetable fibre*, the material that forms the cell walls, and which is found in all parts of plants.
7. A very small percentage of *ash* or *mineral salts.*

The substances named above are, with the exception of cellulose, essential constituents of a perfect diet. The percentages of the different nutrients are so small, however, that most of our fruit has little actual food value. For example, the nutrients contained in the strawberry, according to analyses made at the Ohio State University, are as follows:

Carbohydrates	8.0 per cent.
Protein	.3 " "
Fat	.0 " "

It has been estimated that the minimum daily ration of nutrients for a man of average weight, performing an ordinary day's work, is:

Carbohydrates	500 grams, or	17.6 ounces.
Protein	118 " "	4.2 "
Fat	36 " "	2.0 "

A simple calculation will show that a person would have to consume about 200 ounces, or 13 pounds, of strawberries daily in order to obtain the proper amount of carbohydrates from this source.

In order to secure the necessary amount of protein from the same source, a daily consumption of 1400 ounces, or 88 pounds, of strawberries would be required.

This would be a task that even the most ardent admirer of this fruit could scarcely be prevailed upon to attempt. Take another illustration from the vegetable, rather than the fruit garden.

The nutrients contained in the tomato are as follows:

Carbohydrates	2.5 per cent.
Protein	.8 " "
Fat	.4 " "

Applying the same calculation as before will show that one would have to eat 500 ounces, or 31.2 pounds, of tomatoes each day for the requisite fat; he would have to eat 525 ounces, or 32.8 pounds, for the necessary protein, and for the carbohydrates it would require 704.4 ounces, or about 44 pounds. In other words, if one should eat 44 pounds of tomatoes every day, he would consume slightly more fat and protein than were absolutely necessary for a day's supply, and just about the right amount of carbohydrates.

This demonstrates that, however valuable strawberries and tomatoes may be as a part of an every-day diet, they cannot be considered as foods. Their actual nutrient value is exceedingly low. In order to support life and maintain strength, strawberries and tomatoes must be eaten in connection with other substances which have more concentrated nutrients. Wherein does their dietetic value consist? Let us briefly consider. The qualities which render fruit and many of the more delicate garden vegetables wholesome, and cause us to have a natural appetite for and hence to enjoy them, are their acid juciness and flavor. The juice is mainly water, but it comes to us in a grateful and refreshing form. The flavor is due in part to the organic acids already mentioned, but mainly to certain volatile oils or aromatic ethers. It is to these latter that those delicate, characteristic flavors of various varieties of fruit are chiefly due.

Chemistry and physiology have taught us that, when these "fruity acids," oils, and ethers are taken into the body, they undergo oxidation, which process tends to lower the temperature of the blood, or at least to modify our temperature sensations, and thus correct, or allay, any slight feverishness that may exist. They also tend to keep the organs of secretion, the liver, kidneys, etc., in a healthy condition. We are justified, therefore, in saying that fruits are "cooling, aperient, and grateful." In our climate, subject as we are to rapid changes and extremes of temperature, passing abruptly, as we often do, from an arctic winter to a tropical summer, the physical system is naturally more or less debilitated.

In this condition we are predisposed to malarial troubles, particularly if we live where the drainage is poor. Fruits and acid vegetables are found to be good correctives for this debilitated condition of the system. The free acids of fruits, especially citric and malic acids are highly antiseptic bodies. They tend to prevent disease germs from finding a lodgment and developing in the body.

The full beneficial effects of these acids are only to be found in mature fruits. Green, unripe fruits, although they have an abundant supply of acids, are usually injurious, on account of their indigestibility. This arises, mainly, from the coarse and hard condition of the cellulose. When fruits are perfectly developed and properly matured the cellulose is soft and fine. We know that unripe fruit is not wholesome. It digests slowly, often ferments in the stomach, and is the cause of painful disorders. It is unwise to take into our stomachs that which will ferment and decompose; it is certainly no less unwise to eat over-ripe or wilted fruit, in which these destructive changes have already begun. The question is often asked whether such or such a fruit is *healthy*, even when the question has no special reference to the condition of the fruit itself. All fruits that are eaten ought to be healthy. That is, they should be well matured, sound, and free from disease. As a rule, such "healthy fruits" are for most of us *wholesome*, although they are neither food nor medicine.

The best results possible from the dietetic use of fruits and vegetables come from eating those that are fresh, healthy, and properly matured, and which have been produced by our own skill and industry.

I am dwelling too long upon the relations of the products of horticulture to health.

Let us consider how horticulture as a vocation stands related to the physical, intellectual, and moral well-being of mankind. In order to maintain physical strength and vigor, at least four things are needful. These are pure air, nutritious food, unbroken sleep, and muscular exercise.

That vocation which comes the nearest to supplying these requisites of good health can scarcely be other than a desirable one. Judged by this standard, horticulture stands at the very head of the list. Its quiet, its segregation from strife and jealous rivalry, its unequalled opportunities for nature study, make it at once attractive and healthful. Blessed is he who works in greenhouse, garden, or orchard. As a rule, his day's exertion ends with the evening twilight, and he rises each morning with his physical energies renewed for fresh activity. To him is given that full measure of health only vouchsafed to those who spend most of their waking hours in the free, pure air, and renovating sunshine of the open country.

Health is not only wealth, but happiness, and the superior advantages of horticulture as a healthful vocation cannot be too strongly urged.

Floriculture and small fruit culture are pre-eminently adapted to women. There are few industries where fairer returns for capital and labor expended are more certain; few that can be so well begun with small means, and still remain capable of indefinite extension. Fine fruits and flowers are in universal demand. They are the necessities of the rich and the appreciated luxuries of the poor.

Our densely populated commercial centres, our thronged and fashionable summer resorts, are rarely if ever adequately supplied with them. As a rule, they take all they can get, and then look around for more. You might double the largest annual yield of good berries, or fine roses or carnations, with profit to the producers. The home market for products of this sort is signally elastic, the demand ever keeping well abreast of the supply.

The same is true of winter forced vegetables. In the light of a personal experience of over twenty years, I can confidently affirm that the vocation of horticulture, when wisely and energetically followed, is a profitable one. I believe there are few pursuits which afford as bright prospects, or as full an assurance of reward for intelligent, persistent effort, as does this.

Listen to a few facts. The vegetable forcing-houses belonging to the horticultural department of the Ohio State University have an aggregate glass area of a little less than 4,000 square feet. There are two plain structures which could be built at the present time for about $900 each. The total bench space in these two houses is a trifle more than one twentieth of an acre. During the past five years the annual sales from these forcing-houses have averaged about $600.

The following are among the more important crops commercially grown the past year, and the receipts of each:

Lettuce	$406 10
Radishes	52 25
Beets	45 00
Cucumbers	48 50
Hyacinths	59 25
Total	$611 00

When we consider that these forcing-houses are used but little more than one half of the year the result attained is encouraging. It should be stated that in addition to the above crops there were grown in less quantities, and chiefly for experimental purposes, parsley, peppers, egg-plant, cauliflower, string-beans, onions, and a few other vegetables, including mushrooms, as well as a somewhat smaller list of flowering plants.

The cultivation of the small fruits is likewise peculiarly suitable for women. It is a business for both old and young. Examples are not wanting to show signal successes attained in strawberry, currant, and gooseberry culture, by women as well as men, when begun in the decline of life.

Small fruit culture is an industry that especially commends itself to poor women who are struggling to support their children in frugal independence. Almost any one can obtain control of a cottage with a half acre, more or less, of warm, southward-sloping land, which can be planted with early vegetables and small fruits, in such a way as to be a source of continuous profit. If a small forcing-house can be added, and to this can be accorded that constant supervision without which no industry is likely to prosper, it will be an added source of revenue. In this way many a widow could find a healthful, congenial occupation, which did not require her to spend her days away from home, or subject her to the caprices of a selfish or thoughtless employer. I believe there is no other occupation in which, for the capital invested, success is so nearly certain as in horticulture. Of every one hundred men who embark in trade, carefully collected statistics report that at least ninety fail. Why? Mainly because competition is so sharp and traffic so enormously overdone. If one hundred men endeavor to support themselves and families by merchandise in a town which affords adequate business for only ten, it is absolutely certain that a large majority must fail, no matter how able their management or how economical their living. On the other hand, the number of horticulturists in almost any community might be doubled without necessarily dooming one to failure, or even abridging his income. If one half of the day laborers in the country were to embark in horticulture to-morrow, I do not believe it would render the industry one whit less profitable, while it could scarcely fail to add to the health, wealth, and comfort of all.

I shall have little to say regarding the relation of horticulture to intellectual health. Any true knowledge of the art or practice must be based upon science.

The horticulturist stands face to face with problems which require for their solution the amplest knowledge of nature's laws, the fullest command of science, and the best efforts of the human intellect. In this art, study and mental acquisition, together with a habit of observation and reflection, are equally essential and serviceable. However it may be with others, the horticulturist imperatively needs a knowledge of the character and constitution of the soil he tills, and the plants he cultivates, and the laws which govern their relations to each other.

Geology, chemistry, and botany are the sciences which unlock for him the secrets of nature, and a knowledge of these is among the most vitally urgent of his needs.

Horticulture is an intellectual pursuit, and in its practice the strongest minds may find scope for profitable employment. The one who chooses this profession must keep his mind open and his mental faculties alert by constant observation and study. Horticulture is esteemed by all, because every useful vocation is respected in proportion to the measure of intellect it requires and rewards, and never can rise above this level.

The relation of horticulture to moral and spiritual health deserves a more extended consideration. The horticulturist deals directly with nature, and finds little or no temptation to juggle or stoop to trickery. "Whatsoever a man soweth, that shall he also reap," is immediately and palpably true in his case. Nature never has and never can be cheated.

The horticulturist, acting as a horticulturist, soon comes to realize that his success depends upon absolute verity, and he is not likely to be lured from the straight path of integrity and righteousness. When he goes into the markets and becomes a trader he is subjected to the same temptations as others, and may be enticed into some of the many devious ways of rascality. The whole tendency of his vocation, however, conduces most directly to a reverence for honesty and truth. It is likewise conducive to a genuine independence and thorough manliness of character.

The horticulturist is not obliged to swallow any creed, support any party, or defer to any prejudice, in order to successfully follow his calling.

He may be a democrat, republican, populist, or prohibitionist ; a gold-bug or a silverite ; a free-trader or a protectionist ; Christian or infidel ; yet his fruit and flowers will sell for exactly what they are worth. Social intolerance of adverse opinions is never directed toward him.

But it is horticulture as a *fine art* that has the most abiding influence. Who can measure the effect of the landscape-horticulture of our parks and public grounds, or estimate the value of the external adornment of the home ?

Horticulture is nature's best interpreter, and through this art the blinded eyes may be opened, the dormant aesthetic powers awakened, and the heart made ready for a just appreciation of the beautiful. It is well to bring art into our homes, to adorn and decorate them with painting and sculpture ; but we must not forget that the sense of beauty must be cultivated before the treasures of art can be made our own. If I were called upon to point out one of the most serious weaknesses in our modern system of education, I should answer, "Its failure to accustom the eyes of childhood and youth to the beautiful in nature." The beginning of all true education should be a love of nature, and *nature-study* ought to be the dominant note in every educational system.

What a wealth of beauty there is in tree and shrub and flower,—a beauty of which we never tire, and which "is its own excuse for being !" When the art of horticulture arranges trees and shrubs, flowers and lawn, so as to present an expressive picture to the eye, the beauty is multiplied, and this development of the beautiful is the end and aim of all landscape-horticulture.

The claims of horticulture in answering our spiritual needs are no less than they are in answering our physical necessities.

In the first and most essential of human arts we are beginning to recognize one of the last and most useful of human sciences.

How and *where* and *when* can this art and science best do its appointed work ?

It is a part of my social creed that there need be, and should be, no paupers who are not infantile, imbecile, or disabled.

Yet the world is full of men and women doing nothing, mainly because they don't know how to do anything. To correct this, youth should be a season of instruction in some trade or useful art, as well as in letters and various sciences. There should be a blending of labor with study, of training with teaching, so as to preserve health of body and vigorous activity of mind.

The pupil or student should be enabled to nearly or quite make his way through high school, academy, and college, and go forth qualified to face adversity and maintain a healthful independence. One step toward the accomplishment of this desired end would be the introduction into our country schools of manual training in horticulture. The land required could be easily secured, and the necessary equipment in the way of tools, seeds, etc., would not be expensive.

The work undertaken in these training schools should embrace the cultivation of fruits, vegetables, flowers, shrubs, and trees. In connection with the above the various operations of propagating plants by seeds, cuttings, budding, grafting, etc., should be thoroughly taught. The collection and planting of weeds, the breeding of the more common injurious insects, and the use of remedies, the study of bees and useful birds, a practical acquaintance with our native trees and shrubs, and other similar subjects, might form a part of the instruction and training.

The introduction of such a course would mean an improvement of our schoolhouse grounds, and the adornment of these would have an elevating effect upon the whole community.

If we have beautiful school buildings, with beautiful surroundings, the inference is almost irresistible that we shall have teachers and pupils of greater refinement. To develop all the faculties of body and mind is the aim of modern education. Manual training in horticulture can signally aid in securing this end.

I sincerely hope that the obvious advantages of forming horticultural colonies will be widely and rapidly improved. It would correct the unhealthy congestion of our towns and cities. In no other way can so many be provided with homes, regular employment, and good living. By a horticultural colony I mean the association of from one hundred to five hundred families, in the purchase of a suitably located tract of land, embracing about one acre for each individual. The location, which should be reasonably near some large commercial centre, and the purchase of this land should be intrusted to the most capable and honest members of the association. It should be carefully surveyed and divided into a few small lots, centrally located, for the necessary mechanics and merchants, but mainly into areas of from one to ten acres for horticulture. Ample reservations of the best sites should be made for a schoolhouse, town hall, and public park. The streets should be embowered with shade trees, and every owner of a lot or garden should be encouraged to beautify and adorn it.

I believe such a co-operative effort would secure a modest but comfortable home for any family that could contribute from $300 to $500. If the contribution ranged from $500 to $1,000, a proportionally better home could be secured. Some of the advantages of such colonization over the isolated system of taking up a homestead may be summarized as follows:

First—One tenth of the land required under the old system would be found abundant.

Second—It could be far better selected with reference to markets, and more suitable allotments for fruits, garden vegetables, floriculture, nursery, etc., could be made.

Third—Few draught animals and little expensive machinery would be required.

And, finally, man's social and gregarious instincts would be satisfied.

While ignorance and miseducation ruin thousands, I believe that poverty resulting from involuntary idleness sends more men and women to perdition than any other cause.

Horticulture may never become a universal panacea for destitution and crime, yet I have a joyful trust that thousands will be awakened by it to a larger and nobler conception of the true mission of labor, and by its practice, along the path of simple, honest, persistent work, life may be made easier, and men and women healthier and happier.

T. F. Hunt.

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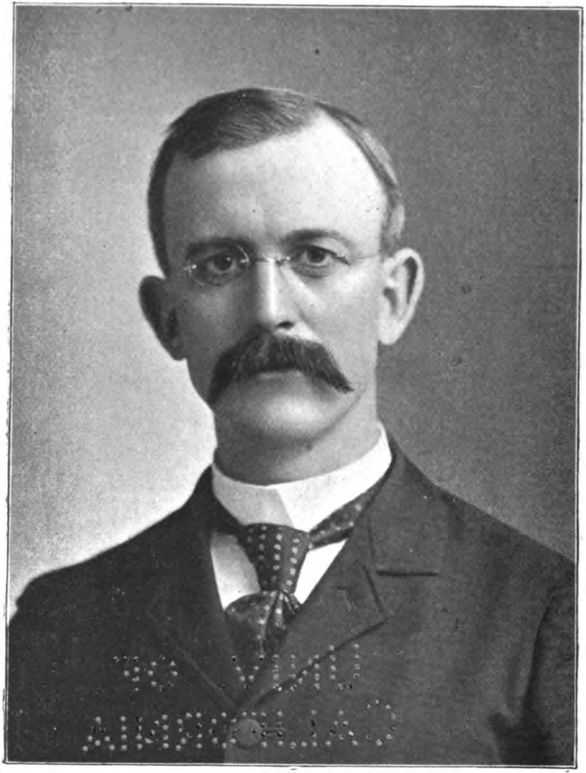

AUGUSTINE D. SELBY.

Columbus Horticultural Society.

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PROCEEDINGS OF THE SOCIETY.

OCTOBER.

The regular meeting for October was held in the Botanical Building, Ohio State University, Saturday the 31st, at 2:30 p. m.

The program announced that this meeting would be held in the Horticultural Building, but, as the first named room was nearer the greenhouse which furnished attractive decorations, in the way of foliage plants and flowers, we gladly agreed to make the change for the sake of convenience.

Ferns, palms, abutilons, chrysanthemums and various other plants made the room very pleasant and attractive. These we were permitted to enjoy through the kindness of the department of Botany. A vase holding twenty-one varieties of fine chrysanthemums made an attractive bouquet. The flowers composing it were grown by the Franklin Park Floral Company and included the following sorts: Yellow Queen, Golden Wedding, Kiota and Major Bonnaffon in yellows; W. G. Newitt, The Queen, Minnie Wannamaker, Joseph H. White, Jessica Elaine, Mrs. Jerome Jones and Viviand Morel in whites. The light pink varieties included Mrs. E. G. Hill and President W. R. Smith; the scarlets, Geo. W. Childs and Defiance; the pinks Maud Dean and Mary Wheeler; while those that might be designated as cream colored, were Dr. Calendreau, Philadelphia and Mrs. J. G. Whillden.

Professor Lazenby gave a report on botany, in which he stated that forty species of plants had been observed in bloom during the month. Many of them were early spring flowers.

As such he named blue violets and several species of fruit trees. This is the proper season to expect to find witch-hazel in bloom. The blossoms that come out now are for next year's fruit so that instead of being our latest blooming plant the witch-hazle is our earliest. How the young fruit of this shrub stands the severe winters is a matter of curiosity and interest, when we make comparison with our common fruit-trees.

Prof. Kellicott— Is the witch-hazel a northern plant ?

Prof. Lazenby—It grows in Northern New York and in Canada.

Prof. Kellicott—I did not know but its northern range might account for its peculiarity.

Mrs. Lovejoy—I have seen the witch-hazel growing in New Hampshire.

Professor Kellicott, in reporting on Entomology, stated that through correspondence with Professor Webster, he had been informed that the cabbage bug, *Margentia histrionica* had been reported from the northern part of the state.

Professor Kellicott stated further, that the stripped cucumber beetle, *Diaprotica vittata*, was extremely abundant on squashes that were immature when frost came, and consequently were left on the ground. He sugguested, that if these decaying squashes were poisoned, coaloiled or treated in some way, many of the beetles would be killed and the possibility of damage to next year's crop lessened thereby.

H. Warren Phelps of Westerville, gave the following report on fruits :

We have had a very fine growing season, and fruit-trees, vines and bushes have borne large quantities of very fine fruits and berries.

Strawberries were least productive. The severe freezing weather of March impaired the vines so that the fruit was not as large and fair as usual. The Timbrel seemed to be the finest of the varieties grown.

Fays Prolific was the best variety of currant, so far as I observed.

Plums gave promise of an abundant crop. But an attack of rot prevented most of them from maturing.

Pears were of fair size and quality and the yield was good.

We had a plentiful supply of peaches. There were many bushels of first class fruit and a great quantity of somewhat inferior fruit. It is noticeable that farmers do not always make proper selections, when they buy fruit trees. On my own farm we had excellent peaches from July 15th, to October 1st.

Apples were never better. They were so plentiful and grew so large that the weight caused many trees to break. Some farmers thinned this fruit early in the season in order to save their trees, and produce a superior article. Apples matured early and are not keeping first rate. Such varieties as Northern Spy, Wine Sap, Fameuse, Pearmain, Baldwin, Alexander and Greening have sold in the Columbus markets during the past three weeks, at 60 cents per bushel in small quantities, while common sorts sold at 25 to 40 cents per bushel.

Prof. Kellicott—What has been the influence, of the past two or three dry seasons, on insects that injure the apple?

Mr. Phelps—They have been decidedly less abundant this year.

Mr. James Best of Westerville said he had tried raising an early variety of potatoes late in the season, but did not meet with success.

Mr. E. C. Green—I have planted potatoes the first of July, and received good returns. This season I was not successful on account of the blight.

Mr. Best—Can you raise Early Ohios by planting in July?

Mr. Green—I have had no experience with Early Ohios but have raised Early Rose at the rate of 150 bushels per acre when planted at that time.

Prof. Lageman—In Kentucky they often plant potatoes in July.

Prof. Lazenby—In the southern states a great many potatoes are planted late for the purpose of producing second crop seed. Seed thus produced is claimed, by northern growers, to be extraordinary. Mr. Ava Agee has experimented with second growth seed, produced in the south, and reports excellent results, even when the tubers planted are not larger than marbles.

E. C. Green—If seed potatoes are spread out in a light room in the spring, they will start good, healthy sprouts. Seed treated in this way can be planted anytime during the summer; and the growth made indoors will count so much after the potatoes are in the ground.

H. W. Phelps—Some of our newer varieties of potatoes seem to rot worse than the Early Ohio.

Mr. J. J. Janney exhibited specimens of Ohio pecans. They were produced in Southern Ohio from trees grown from seeds planted a few years ago.

Prof. Lazenby stated that Mr. Surface, a former member of the Society, is at Cornell taking post graduate work in economic entomology.

Prof. Kellicott quoted a few sentences from a letter, lately received from E. E. Bogue.

Mr. James Best of Westerville read a memorial of the late A. B. Kohr, a fellow townsman. This is printed, in full, on another page.

The regular program was rendered, and was as follows:
"The Weed Fungi of Ohio," F. L. Stevens.
"Chrysanthemums," E. C. Green.
"Preparation for Winter," W. R. Beattie.

The Society then adjourned.

NOVEMBER.

A well attended meeting of the Society was held at Westerville, November 28th. President W. R. Lazenby presided. About forty persons were present.

L. H. McFadden presented a specimen of the notorious Russian thistle, which he found growing on the railroad grounds west of the village.

D. Bonebrake said the fruit crop had been good generally, although pears were not as abundant as they are sometimes.

All fruit is large in size, and unusually perfect this season. The keeping qualities of apples depend upon conditions and surroundings. They should be picked early and placed in the coolest, dry place that you have. Do not place them in the cellar. Mr. Bonebrake presented a specimen of Grimes golden apple and said it was a variety he would not be without, if he could avoid it.

H. Warren Phelps stated that he had experimented this fall in keeping apples for winter storage. He had put the fruit in barrels and placed some in the cellar; some in the house; some out doors without shelter; and some in the shelter of the north side of the house. Those in the cellar had rotted badly; those in the house had rotted some and wilted some; those without shelter had kept quite well; while those on the north side of the house had kept best of all. I would commence picking fruit early and place it in a cool, dry place until there is danger of freezing, and then remove to the cellar.

Prof. Lazenby stated that he was convinced that apples might be picked too early to obtain the best flavor.

A discussion upon varieties of apples was opened by W. R. Lazenby, who gave a list for central Ohio. This list is printed in full below.

Mr. Sessions said it is noticeable that apples grown on low ground in Massachusetts are not so highly flavored as those grown on the hills. He presented two specimens of the Lady

Apple. This variety is small in size but of fine appearance and good quality.

J. J. Janney—I have never seen the Newtown Pippin in the Columbus markets.

W. J. Green—They are produced near here. Ten acres in the Innis orchard, near Columbus, are of this variety.

F. P. Dill—We produce both the yellow Newtown Pippin and the green Newtown Pippin.

Mr. Janney—The Newtown Pippin can be told by its one-sided appearance.

T. A. Scott—What has been your experience with Early Harvest in Ohio ?

W. R. Lazenby—That variety is not productive in some localities.

T. A. Scott—We have found it productive here.

F. P. Dill—If I were growing apples for market I should cut the list down to not more than twelve varieties. In the Columbus markets the Fall Pippin is always in demand in its season. Grime's Golden is asked for and Jonathan has a market at best prices. Belleflour sells well but is not productive. Ben Davis sells well late.

W. J. Green—If one is raising apples for market he must produce varieties that will sell ; but an orchard for family use would be different of course. It is hard to give a first-class list of market varieties for central Ohio. There are several fall apples that are very good, but when we consider winter sorts we find it difficult to compete with the superior fruit produced in the southwest. It is a problem to know just what to do. Mr. Green then presented a few varieties of southwestern apples.

The Arkansas Black is a large, dark red apple of very fine appearance.

The Missouri Pippin is one that can be recommended for central Ohio. It is a little under size, but the trees bear when they are only three years old. It is the custom in some sections, in planting an orchard, to plant twice as many trees as are allowed to stand at the expiration of a few years. It seems that the last named variety would be desirable for such planting. Paragon is another variety of some note.

I can recommend the York Imperial for cultivation in this part of the state. It is a variety that is seldom wormy.

Ben Davis and Rome Beauty are excellent varieties for southern Ohio and the former is of some consequence in this section, but it must come into competition with the superior Ben Davis of the western states.

H. W. Phelps—Don't we often plant varieties on one kind of soil that are better suited to another kind?

W. J. Green—Climate, soil and cultivation must all be considered.

The regular program was as follows:

"To What Extent Shall the General Farmer Engage in Apple Growing?" G. S. Schrock.

"Should Fruit-growers Depend upon Catalogues and Agents of Nurseries in Procuring Fruit-trees, Plants and Flowers?" James Best.

"Diseases of Tomatoes and Cucurbits," Augustine D. Selby.

Mr. Selby not being present his paper was read by title and will be published in full in the *Journal*.

The Secretary presented a bill of $54.50 from Spahr & Glenn, for printing and sundries.

The Society then adjourned.

ANNUAL MEETING—DECEMBER.

The Society met in Horticultural Hall, Ohio State University, December 26, 1896. Vice President Sessions was the presiding officer.

E. Mead Wilcox, Chairman of the Committee on Botany, gave a short summary of work done during the past year. He stated that several plants have been discovered in this county, not heretofore listed in our catalogue." The work on the revision of the Franklin County Catalogue of flowering plants is being pushed and will occupy this winter and next summer.

E. C. Green quoted *Gleanings in Bee Culture* regarding the dwarf Rocky Mountain Cherry, as follows: "Now, the truth is, this cherry is just about as delicious as a piece of soap, and not a bit more."

Mr. Green said of the tree cranberry; it is pretty when in bloom but the fruit is of no value. He also mentioned the Crandal currant and *Elæagnus longipes*, as fruits of interest to investigators in horticulture.

J. H. Lageman of the Committee on Plants and Flowers gave a report.

Mr. Wm. Miller of Gypsum, was elected to membership in the Society.

The election resulted in the choice of the following officers:

OFFICERS.

President	W. R. Lazenby.
Vice President	H. M. Sessions.
Secretary	J. S. Hine.
Treasurer	G. W. Sinks.

EXECUTIVE COMMITTEE.

O. W. Aldrich, D. S. Kellicott, J. J. Janney.

CHAIRMEN OF STANDING COMMITTEES.

Botany	E. M. Wilcox.
Vegetable Pathology	W. A. Kellerman.
Entomology	D. S. Kellicott.
Fruits	O. W. Aldrich.
Library	J. J. Janney.
Meteorology	W. R. Lazenby.
Plants and Flowers	W. R. Beattie.
Vegetables	E. C. Green.

The Secretary read the Treasurer's report. J. J. Janney, W. R. Lazenby and W. R. Beattie were appointed a committee to audit the Treasurer's accounts. This committee announced that said books were correct, and the Treasurer's report was accepted as read.

J. J. Janney read a paper entitled "The Development of New Species of Plants."

W. S. Devol's paper "Observations upon Fruits and Fruit Growing in Arizona" was read by the Secretary.

Prof. Devol sent with his paper a specimen of pomegranate and the following varieties of almonds: Silver Shell, Sultana, Paper Shell, Ne Plus Ultra and Maria Duprey.

Most of the members present considered the first named almond superior in quality to the others. Sultana and Paper Shell are thin shelled varieties and for that reason are desirable table sorts.

The Secretary presented a bill of $26.77. This was ordered paid.

There being no further business the Society adjourned.

J. S. Hine, *Secretary.*

REPORT OF THE TREASURER.

Geo. W. Sinks, Treas., in account with the Columbus Horticultural Society.

RECEIPTS.

1895.		
Dec. 18.	To balance	$144 26
1896.		
Feb. 1.	To interest Columbus & Toledo R. R. bonds	175 00
Feb. 1.	To interest on City bonds	18 00
Feb. 1.	To City bond redeemed	100 00
July 1.	To interest on City bonds	15 00
Aug. 1.	To interest on Columbus & Toledo R. R. bonds	175 00
Dec. 18.	To received of J. S. Hine	24 00
		$651 26
Dec. 26.	To balance	$293 49

EXPENDITURES.

1895.			
Dec. 30.	Paid J. S. Hine, Sec'y		$ 12 50
Dec. 30.	Paid J. S. Hine, bill for periodicals		10 69
Dec. 30.	Paid Spahr & Glenn		64 70
1896.			
April 29.	Paid Spahr & Glenn		103 50
May 2.	Paid Photo Engraving Co		5 30
May 2.	Paid J. S. Hine, Sec'y		12 50
Oct. 7.	Paid Spahr & Glenn		64 00
Nov. 12.	Paid Franklin P. F. Co	$1 08	5 08
Nov. 12.	Paid Gardner & Forest	4 00	
Nov. 12.	Paid J. S. Hine, Sec'y		25 00
Nov. 30.	Paid Spahr & Glenn		54 50
	Balance		293 49
			$651 26

INVESTMENTS.—PERMANENT FUND.

Columbus & Toledo Ry. first mortgage 7 per cent. bonds	$5,000 00
City of Columbus, Ohio, 6 per cent. bonds	500 00
Cash	100 00
Total	$5,600 00

Respectfully submitted,

Columbus, O., Dec. 26, 1896. GEO. W. SINKS, *Treasurer.*

A. B. KOHR.

IN MEMORIAM.

Abram Bowman Kohr, for six years a member of the Columbus Horticultural Society, died at his late residence in Westerville, Ohio, July 23, 1896, aged fifty-four years. He was born at Winfield, Ohio, in April, 1842 and reared on a farm in that vicinity where he learned habits of industry and economy, which habits he maintained to the close of life. He always took a deep interest in Agriculture and Horticulture, and just previous to his death he was planning to engage extensively in raising small fruit on his farm near Westerville.

At the age of twenty years Mr. Kohr enlisted in the Union army, becoming a member of Company E, 126th, O. V. I., continuing in the service for three years. In March, 1865 he was seriously wounded in the foot—this was finally the cause of his death.

In 1870 he graduated from Otterbein University in a class of fourteen, and he was the first of this notable class to fall by death.

In the death of Mr. Kohr, this Society has lost a faithful member ; the community in which he lived, an earnest Christian gentleman and public spirited citizen; his family the truest husband and father.

Resolved, That this Society unite, with many other friends in extending to the family of the deceased our sincerest sympathy and condolence, commending them to Him who has promised to be a Father to the fatherless and the widow's God.

JAS. BEST.

A FORMER SECRETARY OF THE COLUMBUS HORTICULTURAL SOCIETY.

Augustine Dawson Selby, whose picture appears as a frontispiece to this volume, was born on a farm in Bern Township, Athens County, Ohio, Septemper 2d, 1859, and is of English descent. The ancestors of the name appear to have settled in Connecticut and thence to have dispersed. His grandfather settled in Washington County, Ohio, in 1818.

The subject of this sketch grew up on the farm with the usual opportunities of farm boys. The youthful experiences included attendance at the district school, the care of sheep, the cultivation of tobacco, and that which contributed directly to horticultural interest, labor in his father's rather large peach orchard. He recalls that during his youth some fifty acres of land upon the farm was cleared and brought into cultivation by parcels. And it is to the dressing of these new lands in tobacco, with many wild plants springing up, that he dates his earliest purely botanical interest, although the study was not actually begun in earnest until later in life. Mr. Selby's father was a thoughtful farmer and introduced the use of commercial fertilizers upon his farm about the year 1874.

He left the district school and spent one year as a student in an academy at Bartlett, Washington County, Ohio. He began teaching in the country schools of Morgan County, at the age of eighteen, and two years later entered the Ohio State University, Columbus, as an irregular student. He remained at the University, with the exception of one year spent in teaching, till the spring of 1883, devoting his attention chiefly to chemistry, surveying, metallurgy and other studies looking to preparation for work in Mining Engineering. Some months were spent, upon leaving the University, in practical furnace work near Birmingham, Alabama. Not satisfied with this he resumed teaching the same year in Ohio.

In 1884 he was appointed Superintendant of the public schools of Huntington, West Virginia, where he remained two years, resigning to accept the principalship of the Ironton, Ohio, High School. From 1887 to 1889 he was principal of the Garfield School, Columbus, becoming a member of the Columbus Horticultural Society in 1888.

From 1889 to 1892 he was a teacher of Botany and other subjects in the Columbus High Schools, having been teacher of Botany and Chemistry in the North High School from its opening until he resigned in 1894, to accept the position of

Botanist and Chemist of the Ohio Experiment Station, Wooster, which he still occupies.

The summer of 1892 was spent in the laboratory of Dr. Byron D. Halsted, Botanist of the New Jersey Experiment Station, and a large portion of the following collegiate year he was enrolled as a student of the Ohio State University, receiving the degree of Bachelor of Science, in June 1893.

He succeeded Professor Devol as Secretary of the Columbus Horticultural Society in 1889, and served until the next year, when Professor Weed was elected to that office. In 1891 the Society again gave him the office of Secretary which he held until the close of 1894. During his first term, the *Journal* was changed from a monthly to a quarterly magazine. He was chairman of the Committee on Botany for several years, and in conjunction with Moses Craig prepared a preliminary catalogue of the plants of Franklin County. This was printed in the Society's proceedings for 1890. He began to turn his attention to Botany by self instruction and correspondence with Professor Green in 1885, while living at Huntington, West Virginia. This study has since been continued. His work now consists of study of plant disease and weeds in his capacity as Station officer; the department of Chemistry is also in his charge. Mr. Selby was married to Miss Libbie Glover of Franklin County, Ohio in 1883. He has one son, Warren, who is eight years old at the present time.

REPORT ON PLANTS AND FLOWERS

BY J. H. LAGEMAN.

As the beautiful flowers of our gardens and fields are gone, or hidden by a wintry shroud, I shall call your attention to some of our Christmas plants. Our forefathers on the Continent had great respect for mistletoe, *Viscum album*, as it was seen growing in the deep woods of Northern Europe, on the birch, oak and other trees. The white-robed Druid with mysterious ceremonies, cut it with a golden sickle, and used it as a holy offering. In due time, through the influence of Christianity, the mistletoe lost its awe and mystery. But on account of its yellowish-green leaves and white berries so seldom seen on other species of plants in winter, it was selected as a suitable decoration for Christmas. Later it was supposed to possess charms for capturing lovers.

The beautiful green holly with its red berries and sharp thorns is a popular decoration for Christmas-trees, windows, public halls and churches. Holly leaves, when dry, are capable of catching on fire easily and for that reason are considered dangerous by many people.

The pines are most often used for Christmas-trees. The silver pine is often selected for this purpose, as its spreading and whorled branches are nicely adapted for putting in the places of its cones, red, white, blue, green, yellow and violet candles, and other decorations, as candies, apples, nuts and popcorn. The Christmas-tree which was brought to this country about fifty years ago by my German brethren has now become a cherished luxury over the whole world.

Of the evergreen, myrtle and rhododendrons, sometimes used instead of holly for Christmas wreaths, I shall not speak to-day ; but let me mention one more plant. It is the rose of Jericho, *Anastatica hierochuntica*, the very emblem of Christmas. This little plant belongs to the Cruciferæ or mustard family, and grows from six to eight inches high in the Arabian desert and in Palestine. After its blossoms are gone the branches close together in the form of a globe, or egg. When uprooted by the wind they are driven over sandy deserts in ravines where they collect in great piles. When moistened it opens, and often blossoms again. Folks-lore says it opens by itself on Christmas night—so it will do when you put it into a glass of water. The rose of Jericho is sold, by traveling Arabs, as a remembrance of the Holy Land. The specimen I show you was bought at the World's Fair at Chicago.

* * *

COMMUNICATIONS AND DISCUSSIONS.

OBSERVATIONS UPON FRUITS AND FRUIT GROWING IN ARIZONA.

WM. STOWE DEVOL.

Arizona is not given over entirely to the rattlesnake, horned toad and red man, to the cactus, mosquito and sage brush, though from the representations of the *Arizona Kicker* and the wild west stories constantly appearing in magazines and newspapers respecting this region, one would be led to believe that such is the case.

What little I may say in these notes may possibly dispell some of the misconceptions which no doubt the members of this society entertain respecting this new and promising country.

Notwithstanding that less than one per cent. of the area of Arizona—comprising an area three times the size of the state of Ohio—is now under cultivation, the variety of products grown upon our soils is very great. We have, in Arizona, a range of altitude from almost sea level along the Colorado river between Yuma and the Gulf of California, to upwards of thirteen thousand feet at the summit of San Francisco peak, and between these extremes vast plains and broad valleys, many of them one thousand to seven thousand feet above sea level.

You can readily see that with such a range of altitude at our disposal we may choose almost any climate one might wish, save that of great moisture; consequently we have, as I have said, a great variety of fruits.

During the past season the date, one of the most tropical of fruits, has ripened to perfection at Phœnix and I believe also at Yuma. Some are of the opinion that our climate will surpass even that of Persia for the production of dates. I have in our museum, in the University of Arizona, a bunch of dates from this past season's crop that equals if not surpasses in quality any that I have ever eaten from the date growing region of the old world. As grown here it is an easy crop to produce, though it requires four, five or six years for the young date palm to come into bearing. The plant has few insect enemies and is easily grown. It only requires that sufficient moisture be supplied and that the temperature does not fall below 27° Fahrenheit in winter.

About Yuma and in the Salt River Valley, in which Phœnix is located; citrus fruits are grown to perfection. The Washington naval orange ripens at these places in time to reach the markets of the east for Thanksgiving. The qualtity of the oranges, lemons, and grape fruits grown in these regions compares favorably with that of the most favored and most widely known of the citrus fruit regions of the United States. These fruits are more carefully cultivated here than are the fruit orchards of most places in the east. The ground of an orchard is made as smooth as a floor, sloping very gently in order that irrigation may be done with ease and thoroughly. The trees are then set in rows about twenty feet apart, giving one hundred and eight trees to the acre. The ground is kept in perfect tilth, not a weed being permitted to grow in the entire orchard and after each irrigation the ground is cultivated and re-cultivated from two to five times.

The third year after setting oranges, pomeloes and lemons a few fruits may be gathered and the fifth season a considerable crop is usually produced. By the eighth year the trees are in full bearing. Although oranges ripen in time for the fruits to be placed upon the market for Thanksgiving the crop is not necessarily gathered at that time. In fact but a few of the ripest fruits are selected here and there from the trees for this early market. They may be gathered as they ripen for at least two months thereafter, and should there not be sufficient frost to injure the fruit it may be permitted to remain upon the tree until the spring months, at which time, though some of the juiciness may be lost, the fruit is much sweeter than when gathered before the holidays.

The pomelo, or grape fruit, is just beginning to find favor in the eastern markets and there is now a sort of boom in the demand for this fruit. Responding to this rapid increase in the demand large areas are being set to pomelo in Arizona and especially southern California.

The lemon, properly grown, will have ripening fruit upon it nearly every month in the year, and in Arizona I find the fruit having waxy skin and very fine flavor.

Arizona seems to have an ideal climate for the production of pomegranates. Though not planted in orchards several varieties of the pomegranate are extensively planted along borders, in groups for ornamental purposes, for wind breaks and hedges and they fruit abundantly. There is but a limited demand for this fruit in the market, but I think that there would be an extensive call for it in the east could the people become accustomed to eating it there and learn that it could be so well shipped to them.

We experimented this year in making jelly from the fruit of several kinds and found that a good quality of jelly may be made from the acid varieties. The sub-acid varieties will make jelly but not of good quality, while the sweet varieties are not fit for this purpose.

The fruit of some varieties is highly colored and very ornamental, while others have a more sombre hue and all present an attractive appearance with their loads of fruit and glossy dark green leaves.

We have strawberries ripening in Arizona every month of the year. In some portions of this territory, however, the plants are grown with considerable difficulty because of the extreme heat. There are some growers, however, who are meeting with marked success, but most of us have considerable yet to learn before we may claim to be successful strawberry culturists. The variety most in evidence here is called the Arizona Everbearing, a berry resembling the Crescent.

The season for the blackberry is here more than double that of Ohio. The raspberry does not do so well as most other small fruits.

The fig crop, in orchards where there is an abundant supply of water, is enormous ; but we have not yet learned how best to dry the fruit in order to meet the demands of the taste of those who are purchasers of this fruit, consequently figs are a drag in the market in this region and thousands of pounds are fed to swine each year. I may state incidentally that hogs fattened on figs produce a superior quality of pork. Fresh figs may be purchased in the market at about two cents a pound. Not all people are fond of fresh figs. With many the taste is an acquired one. I did not enjoy the first fresh fig that I ate but now consider the fruit a most delicious one for breakfast, especially when peeled, sliced and eaten with sugar and cream. Some varieties dry upon the trees, producing a fruit resembling in some degree the imported fig but with a tougher skin. Other varieties, however, will not dry but sour if the fruit remains upon the tree, while still others drop the fruit as soon as ripened.

During a tour of the northern part of the Territory, made last summer, I visited about all the agricultural and fruit growing communities of that region and found there some of the finest fruits I have ever seen in all my life. Among these were nectarines, as large as tea cups, beautifully colored juicy and luscious ; peaches, averaging nearly a pound each, gathered from the trees as they come, and more highly colored han any I had ever before seen. The flesh was fine grained juicy, melting and the flavor superior to any peaches I had ever eaten before. The grapes are mostly the California and foreign varieties, and I found there some vines so loaded as to convey the appearance, when the leaves were removed, of great heaps of fruit. Some eastern grapes, as we of Arizona call those from the states, are also grown, but they are rare.

It is a common remark among people, when they come from eastern states to this region and the Pacific coast, that no good apples are grown west of the Rockies. This, too, is an error. I received this summer from a mountain ranch near the Mexican border some large, beautifully colored, apples of excellent quality, and during my trip to the northern part of the Territory I saw there most excellent apples.

Pears of fine quality are produced here and the apricot seems to be at home under the clear sky and beating sun of Arizona.

Most fruit trees come to bearing much earlier here than in the east and the growth of young trees is marvelous, especially on good soil where water is abundant. I have seen peach trees make a growth of twelve feet the first season after being set. Apricots do not grow so tall but will have nearly as much wood upon them because of the large number of branches. Pears shoot up like spires and nectarines form a large, spreading tree in two or three years.

The Mexican population are as fond of melons as the negro of the south and, I believe, the native Indian has a still greater fondness for the water melon. These are grown in Arizona in abundance and with but little care, and their season is a long one. Ripened melons are on the market before the fourth of July and they are still being brought into town.

There is a native walnut that is of good quality and the English walnut is easily grown. Almonds are now fruiting well in the Territory and many predict that this is the region par excellence for almond growing.

There is one great drawback, however, to Arizona fruits becoming generally known and that is the enormous charges made by railroads for transportation. The freight rates make it necessary that fruits shall be produced for almost nothing in order that they may reach the market and successfully compete with the fruits of other regions ; but residents of Arizona are favored indeed for our climate and soil give to us fresh fruits the year around and these of a quality leaving little to be desired by the most fastidious taste.

TUCSON, ARIZONA.

A LETTER FROM OKLAHOMA.

BY E. E. BOGUE.

Fruit growing in Oklahoma has on the whole been successful this season. Some kinds of fruit have suffered from the hot dry weather although the rainfall has been more here since the first of July up to the present time than has been before reported during the same time, since the measurements were first taken about five years ago.

The most abundant horticultural crop, if it may be classed as such, is that of melons. They have been on the market since about the middle of July. Five cents each has been the price for choice and some have retailed for one and one-fourth to two and one-half cents each. Canteloupes have been the same price and quite as abundant.

Citrons are volunteer here and assume a weedy character. Some are allowed to mature and are fed to cows that are kept in town.

Cucumbers are scarcely placed upon the market in Stillwater. The bugs destroy the plants early in the season and discourage the grower.

Cabbage retails for four and five cents per head of medium size.

Tomatoes are grown very extensively so that they may be had for about thirty cents per bushel.

Potatoes are poor both in yield and quality.

Most vineyards have produced well this season but the growers started to demand five cents per pound but finally had to fall to three and one-half and many were allowed to perish for want of a proper market. However, I think if the marketing had been properly done a fair profit might have been received. Ohio grapes retail at forty cents per box.

While there has been an abundance of peaches the quality has not been very good. The price has ranged from thirty to eighty cents per bushel.

Apples are not produced much as yet. The trees are mostly too young. Those brought in from the states retail at thirty-five cents per peck.

I have not tasted of a pear this season and have seen them on market but once and that was early in the season.

Plums are grown a little ; though not enough as yet to make any showing in market. The wild plums that grow here are gathered and kept on the market in season.

Cherries and quinces are not seen on market.

Raspberries are not grown as yet but may find a home here in time.

Blackberries were a good crop and brought a good price. The lowest I knew of their selling, was three quarts for a quarter of a dollar.

Strawberries it is claimed can not be successfully grown here on account of the long dry summers but I think that some of the more enterprising men will learn to know the proper treatment in this climate and we shall be able to enjoy them for less than fifteen cents per quart the price we had to pay this season.

There is no wild fruit here but the plum and the expense of shipping in, is enough to encourage home growers so that in time the horticultural interests of this part of the country will be considerable.

One reason why fruit does not sell better is that it is not put in convenient, neat and attractive packages, but is sold in bulk.

TO WHAT EXTENT SHALL THE GENERAL FARMER ENGAGE IN ORCHARD GROWING?

BY G. S. SCHROCK.

Just why your committee should assign me to the above topic is not clear to me. Possibly my more or less succesful guesses in the past has caused the honorable gentlemen to believe that I am clothed with a mantle of prophesy.

He is indeed considered a shrew farmer who can forsee even a year ahead the probable yield or price of any staple farm crop.

A prophet then in truth were I, could I demonstrate the profit or loss of orchards planted now that will only just begin to become productive in ten or twenty years.

Disclaiming any powers of second sight, or even of being able to see farther through a grindstone than the common run of humanity, yet in my opinion the general farmer should more extensively engage in growing orchard fruits.

The curse or as some of us say crime of falling prices for all agricultural products, has caused many farmers to jump from this to that branch of argriculture like a flee on a hot griddle, in hopes——generally vain ones——that they might find something really profitable, yet people are so constituted that they usually seek for quick returns, so the orchard has not as yet proven a craze as was potato growing a year or so ago, not because there is not a profit in the orchard, but because the planter must needs wait a longer time for a dividend.

Speaking only of this immediate vicinity, I do not think one young apple tree has been placed in our orchards during the past ten years, where two old trees have died or been destroyed. And undoubtedly the majority of trees planted out consisted only of a tree or two at a place, purchased of some tree-agent just to get rid of the fellow and the tree—well usually it is some novelty that produces most beautiful and perfect fruit, on a full page lithograph in the tree-agent portfolio, but the tree itself in not bearing yet.

Please do not think that I am prejudiced against the tree-agent, such is not the case. The honest, upright tree-agent thoroughly posted in regards to varieties adapted to the locality he canvasses, and representing a respectable nursery is a good citizen, and by his labors sees many trees planted that would otherwise remain in the nursery's rows. But there are too many of the other fellows, men who seek to live by their wits, who are the cause of many blasted hopes and a total loss of confidence in the profitableness of the orchard in many instances.

This year's crop of fruit is said to be the largest ever grown in the United States, not so much because of a rapid increase of bearing orchards, but from the fact that an exceedingly large area produces this year an extremely abundant yield. Seldom indeed does so large a per cent of the fruit growing territory produce a full crop the same year. With so large a crop, especially of apples, prices are low, and yet compared with other products of the farm, the orchard still shows a greater profit especially if the item of soil exhaustion is taken into account in computing cost of crop.

We are becoming more and more a fruit consuming people. Statistics prove that the people of the United States consume less wheat per capita than they did fifteen or twenty years ago. Facts prove that in the place of wheat, fruit forms an increased portion of their food.

'Tis said too that the population of our country doubles in about thirty-four years. With these facts in mind, what is there in the future but bright prospects for the man who grows the orchard.

To the general farmer, the orchard and its care and the care and sale of fruit should not materially conflict with the ordinary routine of farm crops, but on the contrary, the apple orchard is usually found to occupy a desirable place, in the farm management.

Aside from the apples marketed, the apple orchard possesses greater value as a feeding crop for stock and especially hogs, than has been given it in the past. The hog grower can afford to plant considerable acres with sweet apples solely as food for the growing pigs, in fact I know of no more profitable use for rough and broken ground unsuited for cultivation, than it be planted with various varieties of sweet apples, where grass and fruit would grow hogs with but little grain and less labor.

Though the future for the coming orchard looks bright indeed, yet the extent to which we may embark in the business in a great measure depends upon four things:

1st. *Upon the Character of the Soil.*—As with every other crop we can grow, the orchard is not suited to all soils. It were folly indeed to attempt to grow an orchard upon low level wet ground, and even thorough tile drainage does not always render wet soil suitable for the production of choice fruit. The most profitable orchards of apples in the community were those grown on sugar-tree land. Though nearly all rolling clay soils may be made the site for a good orchard with careful management,

2d. *The Man.*—To make a success of the orchard and especially the commercial orchard, depends as much upon the man as upon the soil. A natural or acquired taste or—as the ladies would say, love—for the orchard and its fruits is the prime factor of success.

Fruit growing requires a distinctly different education from growing corn or wheat, and the orchard planter should be a close observer and a careful student with the present easy access to horticultural literature, there is no excuse for ignorance, upon subjects relating to the orchard.

One of the great questions which confronts the planter is;

3d. *Selection of Varieties.*—Upon the correct solution of this problem depends whether success or failure shall attend the efforts of the planter. In general, it is wisdom to shun all novelties in fruit, no matter how highly lauded, and plant only such varieties as have proven successful in the locality. There are usually a few varieties that are always sought after by the consumer, at an advance above ordinary prices, and it is certainly wisdom to grow, if possible what the purchasing public demands.

4th. *The Market.*—Where the market is of easy access, as in the vicinity of our great cities, the orchardist can find a market for varieties ripening at all times throughout the season, and often it is the nearby grower that receives a handsome price for fruit, when the weather conditions are such that shipped fruit is damaged before reaching market.

More than this, where the grower is near the consumer, costly freight rates and salesmen's commissions are saved to the grower, and to the man, who places only perfect and attractive fruit before his customers, and who seeks to deal fairly and honestly at all times, the market will grow and broaden out from year to year, until the question will not be so much, to what extent shall the general farmer engage in orchard growing ? but rather, be, to what extent shall the orchardist engage in general farming.

PREPARATION FOR WINTER.

BY W. R. BEATTIE.

At this time of the year or perhaps beginning a little earlier the landscape gardener's work naturally divides itself into two parts, first that of selecting and preserving stock plants from which next year's plants are to be grown, and second cleaning up rubbish of the past season's growth and protecting semi-hardy plants from the severe cold to follow. Enough stock should be preserved to insure a good supply of cuttings, even though one-half may be lost in the cutting bed. The propagating bed should be in prime condition and so that a temperature of apout 80° F. may be maintained. Much of the stock may be taken in as cuttings alone, yet it is generally best to keep a few of the old plants.

Seeds should be gathered and spread out to dry ; it may not be economy to gather certain seeds, the price being so small, yet if we have a plant that has established certain points of superiority it is better to save the seed and be sure of good stock and not depend upon the dealers. Of course all painting, repairing and glazing should be done earlier in the season so that nothing of the sort may interfere with the regular fall work.

Soon as frost has destroyed the beauty of the flower beds the old plants should be removed and the beds if to be used another season well fertilized or if not to be used again should be sodded over ; this will save much valuable time during the spring planting.

The lawn should have special attention, being raked and cleaned of undesirable plants or rubbish such as fallen branches of trees, etc., any uneven spots filled with soil and a sprinkle of seed here and there; a good mulch will do no harm and may be applied soon as the growth ceases.

Bulbs such as hyacinths, narcissus, tulips, etc., have become so cheap that it is advisable to fill beds ready for spring flowering, and a few crocuses and snow drops stuck down at random over the lawn present a very pretty appearance as they peep up almost before the snows have melted. Semi-hardy shrubs and plants of a tender nature should very soon now be protected either by laying down and covering with earth, by binding straw around the stems or by surrounding with a cold frame, with sash cover.

Rhododendrons, hydrangea and such plants may in partially protected places be left to care for themselves, but a slight protection will do no harm—leaves form one of the best protectors. Care should be taken always in providing mulch or covering, that it be free from weed seed.

The old maxim, "Do not put off until to-morrow what might be done to-day," is applicable to this work in its fullest sense.

Preparation of soil to be used during the winter should not be neglected. Now is the time to pile up sods, (better a loamy blue grass sod) with layers of manure between; this should be turned once or twice before freezing up for the winter. The remainder of the pile of soil composted last year should now be brought under shelter where it may be always accessable. Sand leaf-mold and well rotted manure are also indispensable in making up potting soils to suit different plants; for instance, for begonias, sand, leaf-mold and cow manure; for geraniums, sand and heavy clay compost; for coleus, loam compost, a little sand and leaf-mold or muck, and so on—scarce no two species requiring the same soil.

Out door vases and fountain basins that hold water should be covered, inverted or better where possible put under shelter as the frost will invariably burst them or crack cement; fountain basins will be safe if covered well with straw or soil; water pipes can be empted or covered with asbestos.

DEVELOPMENT OF NEW SPECIES OF PLANTS.

BY J. J. JANNEY.

Can a new species of plant be brought into existence?

Haeckel wrote, the species is the whole succession of organisms which exhibits the same form in the same environment.

Some have generalized a species as being recognized by their incapacity for the production of fertile hybrids, others have defined it as including all the beings which have descended from parents, created with the essential character now belonging to the species, and according to Buffon, a species is a constant succession of individuals similar to and capable of producing each other. Cuvier says, "a species is a succesion of individuals which reproduceand perpetuate itself."

DeCandolle says, "We write under the designation of species all those individuals that mutually bear to each other, so close a resemblance as to allow our supposing that they have proceeded—originally from a single being or a single pair."

Lamarc supposed the species living at any time to be the result of the gradual modification of pre-existing species. He thought an animal being brought into new circumstances, and called upon to accommodate itself to them, the exertion which it consequently made to that effect caused the rise of new parts; on the contrary, when new circumstances left certain existing parts unused, these parts ceased to exist. Something analagous was, he thought produced on vegetables by changes in their nutrition, in their absorption and transpiration, and in the quantity of heat, light, air and moisture which they received.

Linnaeus says, "We reckon just as many species as there were forms created at the beginning."

Darwin says, "I am fully convinced that species are not immutable, but that those belonging to what are called the same genus—are lineal descendants of some other and generally extinct species." He says further, "No one definition of species has as yet satisfied all naturalists, yet every naturalist knows vaguely what he means when he speaks of a species; generally the term includes the unknown element of a distinct act of creation."

Webster defines species as the "ideal group of individuals which are believed to have descended from common ancestors, which agree in essential characteristics, and are capable of continued reproduction through the sexes." Darwin, in "The Origin of Species" gives no definition of the term.

The consensus of opinion would indicate that we need not expect to create a new species, because as Linnaeus expressed it, all existing ones "were forms created in the beginning." But Lamarc held that new and simple forms are continually being produced by spontaneous generation. Darwin rejects this idea. He says, "I need hardly say that science in her present state does not countenance the belief that living creatures are now ever produced from inorganic matter."

The Century Dictionary says, "New species have always been in process of evolution and still continue to be so developed."

New varieties are produced in abundance, as may be seen in any orchard or garden, and Darwin found great difficulty in distinguishing between species and varieties. The transition is so indefinite that the line of separation is hard to define ; for example, the number of described german species of hawkweed has ranged from 300 for one author, to 106 for another, and 52 for a third to less than 20 for a fourth, and yet Darwin says, "The view generally entertained by naturalists is that species when intercrossed have been specially endowed with the quality of sterility in order to prevent the confusion of all organic forms;" and yet he has given some striking illustrations of the almost total neglect of nature to separate organic forms, and the puzzle of naturalists has been and is, to find some kind of order in that confusion. The line of demarkation between species is so narrow and indefinite in many cases as to baffle the observer, and the line between the animal and the vegetable kingdom is almost invisible.

Is it practicable to produce a new fruit, a new vegetable or a new plant ? It is not, it may be assumed, if the idea that every species came from an original creation. If this be true, we need not expect another creation of the same kind, but can we not evolve from some known plant a new form of use to mankind, which though perhaps not technically a new species, would be so practically ? I have no doubt there are many roots and berries in the forest of this continent, which have as great potency of good in them as many now cultivated had in their wild state.

But my object in writing this paper is to introduce the folfowing from an address by Professor L. H. Bailey read at the meeting of the Massachusetts Horticultural Society, February 24, 1895. He said all thoughful persons are now evolutionists, whether they know it or not. They believe in some kind of transformation of species in the same way that they believe in the gradual unfolding and growth of human institutions. He said:

"De Varigny has written a most suggestive book upon experimental evolution, in which he contends for the establishment of an institution where experiments can be definitely undertaken for the purpose of transforming a species into a new species. "In experimental transformism," he writes, "lies the only test which we can apply to the evolutionary theory." This is a most commendable object, and I hope that the attempt will be made to create a new species before our very eyes. This is what most people demand as a proof of evolution, and they are sometimes impatient that it has not been done; and it would seem, upon the face of it, that nothing more could be desired. When I reflect, however, upon the fact that this very thing has occurred time and again with the horticulturist, and consider the botanists and philosophers persist in refusing to see it, I am constrained to offer some suggestions upon De Varigny's excellent ambition. If I show a botanist a horticultural type of recent or even contemporaneous origin which I consider to be specifically distinct from its ancestors, he at once exclaims that it is not a species, but a horticultural variety. If I ask him why, he replies, "Because it is an artificial production." If I show him that the type is just as distinct from the species from which it sprung as that species is from its related species, and that it reproduces its kind with just as much certainty, he still replies that, because it is a horticultural production, it cannot be a species. In what, then, does an accidental horticultural origin differ from any other origin? Simply in the fact that one takes place under the eye of man and the other occurs somewhere else. It is impossible at the present day to make a definition of a species which shall exclude many horticultural types, unless an arbitrary exception is made of them. The old definitions assumed that species are special creative acts, and the method of origin is therefore stated or implied in all of them. The definition itself, therefore, was essentially a statement of the impossibility of evolution. We have now revised our definitions so as to exclude the matter of origin, and thereby to allow free course to evolution studies; and yet here is a great class of natural objects which are practically eliminated from our consideration because, unhappily, we know whence they came! Or, to state the case differently, these types cannot be accepted as proofs of transformation of species because we know certainly that they are the result of transformation."

Now, just this state of things would be sure to occur if De Varigny were to transform one species into another. People would say that the new form is not really a species because it is the result of cultivation, domestication and definite breeding by man. He could never hope to secure more remarkable transformations than have occured a thousand times in the garden; and his scheme—so far as it applies to plants—is essentially that followed by all good gardeners.

This notion that a species, to be a species, must have originated in nature's garden and not in man's, has been left over to us from the last generation—it is the inheritance of an acquired character. John Ray, towards the close of the seventeenth century, appears to have been the first to use the word species in its technical natural history sense, and the matter of origin was an important factor in his conception of what a species is. Linnaeus's phrase is familiar, "We reckon as many species as there were forms created in the beginning." Darwin elaborated the new conception—that a species is simply a congregation of individuals which are more like each other than they are like any other congregation—and with a freedom from prejudice which is rarely attained even by his most devoted adherents, he declared that "one new variety raised by man will be a more important and interesting subject for study, than one more species added to the infinitude of already recorded species." The old naturalists threw the origin of the species back beyond known causes; Darwin endeavored to discover the "Origin of Species," and it is significant that he set out without giving any definition of what a species is. I have said this much for the purpose of showing that it is important when we demand that a new species be created as a proof of evolution, that we are ourselves open to conviction that the thing can be done.

The fact is that the practice of systematic or descriptive botany is at variance with the teachings of evolution. Every naturalist now knows that nature does not set out to make species. She makes a multitude of forms which we, merely for purposes of existing methods of botanical description and nomenclature, call species.

Species-making forever enforces the idea of the distinctness and immutability of organic forms, but study of organisms themselves forever enforces an opposite conception. The intermediate and variable forms are perplexities to one who attempts to describe species as so many entities which have distinct and personal attributes. So the garden has always been the bugbear of the botanist. Even our lamented Asa Gray declared that the modern garden roses are "too much mixed by crossing and changed by variation to be subjects of botanical study." He meant to say that the roses are too much modified to allow of species-making. The dispair of systematic botanists is the proof of evolution.

If species are not original entities in nature, then it is useless to quarrel over the origination of them by experiment. All we want to know, as a proof of evolution, is whether plants and animals can become profoundly modified under different conditions, and if these modifications tend to persist. Every man before me knows, as a matter of common observation and

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practice, that this is true of plants. He knows that varieties with the most marked features are passing before him like a moving panorama. He knows that nearly every plant which has been long cultivated, has become so profoundly and irrevocably modified that people are disputing as to what wild species it came from. Consider that we cannot certainly identifiy the original species of the apple, peach, plum, cherry, orange, lemon, wine grape, sweet potato, Indian corn, melon, bean, pumpkin, wheat, chrysanthemum, and nearly or quite a hundred other common cultivated plants. It is immaterial whether they are called species or varieties. They are new forms. Here is the experiment to prove that evolution is true, worked out upon a scale and with a definiteness of detail which the boldest experimenter could not hope to attain, were he to live a thousand years. The horticulturist is the only man in the world whose distinct business and profession is evolution. He, of all other men, has the experimental proof that species come and go."

(*From the Proceedings of the Seventeenth Meeting of the Society for the Promotion of Agricultural Science, held at Buffalo, N. Y., August*, 1896.)

THE RELATION OF SCIENCE TO AGRICULTURE.

BY WILLIAM R. LAZENBY.

In briefly discussing the relation of science to agriculture, it will be well at the ouset to try to understand what we mean by "science."

In this age almost every branch of knowledge, every pursuit, vocation or profession, is dubbed a science, or we are told that it is both a science and an art. It is plain that not every branch of knowledge is a science, but where shall the line be drawn? Instead of trying to define science in a few words, let us notice some of its more important characteristics. In the first place science deals with objective truth which is the same for all. In other words, it has to do with statements of facts which may be verified. Any branch of knowledge, with a considerable array of facts, upon which all men by the compelling power of inherent truth may be brought to an agreement, is a science. It classifies and systematizes facts so that they express the laws of nature, or in the language of Kepler—the thoughts of God. Isolated facts, however great the number, are not science any more than isolated words are sentences.

Various branches of knowledge are continually rising to the dignity of science. This is especially true of all knowledge that appeals to the physical senses, to the reasoning powers or to the intellect of man. We are perhaps justified in calling agriculture both an art and a science. We know that it is the first and most essential of human arts, and we believe that it is fast attaining the dignity of one of the most important of human sciences. It is and probably ever will be more of an art than a science.

We must not confuse science with art. Art is practice, execution. It has to do with the ways and means of accomplishing certain ends. Science has to do with the explanation of these ways and means. It deals with causes and effects. In its strict significance, it has nothing to do with practical applications, and is not directly concerned with economic results.

Probably there is no art or profession known to man that draws its knowledge from so great a variety of sources as does agriculture. Nearly every known science is contributing some facts that are either directly helpful, or which are at least suggesting new lines of inquiry, observation and experiment.

In our age, the sciences of chemistry, physics, botany, geology and entomology are among the most intimately related, and are probably the most helpful to agriculture. It can scarcely be disputed that these sciences are the natural bases of a sound practical knowledge of the every-day things of life, a knowledge which the farmer of all men can least afford to miss.

Of the sciences named above, chemistry plays the most important part, being intimately connected with, and concerned in, those transformations or changes in material substances which the agriculturist is constantly endeavoring to effect.

Without chemistry, it is impossible to understand the character and constitution of the soil, the elements of which it is composed, and the laws which govern their relations to each other. Who can measure the influence that the first great lesson taught by chemistry has had upon the agriculture of the world? The lesson is, that matter can neither be created nor destroyed.

Chemistry proved beyond question that every minutest particle of the plants which go to make up the crops of our fields and gardens, the roots and branches, stem and leaves, buds, blossoms and fruit, all come from the preexisting matter found in other forms in earth and air. The growth of the corn-stalk or an apple tree is simple transformation, not creation. Burn the stalk or the tree, and the proofs of chemistry are equally conclusive that all the component parts are in the gas, smoke and ashes, ready to be transformed or assimilated into another stalk or tree. We know, therefore, that no finite power can either create or annihilate a single particle of matter. Coming to one of the latest and no less interesting or important lessons of chemistry, and we find in it the complete overthrow of a supposed definite distinction between organic and inorganic matter. The artificial production in the laboratory of any organic compound whatever, appears to be a mere question of time and skill. It is quite safe to predict that chemistry will ultimately succeed in generating every organic substance known. It may be doubted, however, if chemistry can ever go much further in this direction. Science may be able to form sugar, pectose, malic acid, and all the ingredients of our apple; it may produce in like manner the starch, cellulose, vegetable fibrin, etc., found in the potato, but when all this has been done, it will be as impossible as ever to artifically produce a single specimen of the Rhode Island Greening or Early Ohio.

It is well known that every plant, large or small, herbaceous or woody, annual, biennial, or perennial, is composed of certain elements or compounds, whereof by far the larger portion comes from the atmosphere, a much smaller, though constant and no less essential part, coming from the soil. The elements which are absorbed or imbibed directly from the atmosphere, are usually found in abundance, and are yielded free to all growing plants. Hence, the really important question is this: Are the necessary elements that are furnished by the soil present in such quantities and under such conditions, that the needs of the plant are fully supplied. As a general answer to this question, I believe that it can be safely asserted that there is not a single acre of land anywhere within the borders of the United States, so rich in all the elements of available plant food, that the production therefrom could not be increased by some application of fertilizer. The intelligent practical agriculturist or horticulturist cannot fail to ask himself the following questions:

1st. Wherein is my soil deficient?

2d. How can I best restore and maintain fertility?

Can science answer these fundamental questions? Perhaps not definitely or confidently. But who unaided by science, can answer them at all? Can practice? No! Practice is silent after sixty centuries of experience. Who can decide whether the soil does or does not contain the elements requisite for a healthy growth and perfect development of wheat or potatoes, or strawberries or apples?

Who knows, except as he blindly infers from results, what mineral ingredients of his crop are deficient or in excess? How shall one ever know, unless enlightened and assured by the aid of science? Let me not be misunderstood. Science cannot answer all questions. It often fails. But only give science time enough, and it will tell us the truth and the whole truth in the end.

The analysis of soils, whereof much was heard and more was hoped a few years ago, has fallen into utter discredit, and the analysis of feeding stuffs and fertilizers appears to be of doubtful value as far as its determination of practical results is concerned. Let us concede that every analysis yet made was and is useless, yet this should not shake our faith that the time is coming when under the guidance of a more highly developed science, a science that is more profound, soils and the products therefrom will be analyzed so that the results shall be directly and signally profitable. As we have seen, the science of chemistry has not failed to teach us that every pound of grain or hay, orchard fruit or garden vegetable, abstracts from the soil in which it grows certain mineral elements, and that the soil is the poorer by just the amount so taken. The amount abstracted may be small and the residue large, but as no bank deposit was ever so great that continued drafts would not ultimately exhaust it, so no soil was ever so rich that continual cropping with giving nothing back would not ultimately render it sterile and worthless. Science teaches us how to prevent such exhaustion, in part by the use of clover and a judicious rotation of crops and in past by a constant replacement of the elements annually borne away.

If time permitted, I might show what physics, botany, geology, entomology, meteorology and other sciences have done for the farmer's art. It is not my purpose however, to dwell on details more or less familiar to all, but to point out in a general way the relationship between science and agriculture. We should not forget that all the science in the world has never of itself made one good farmer. The art of agriculture is learned by practice, by imitation, by experience. Good crops are raised at the present time by men who know nothing of science and do not consider an acquaintance with it in any way conducive to success. It is also true that many a man with a fair knowledge of science has signally failed when he attempted to put his knowledge into practice on the farm. Have we not the right to question the value of our much boasted, almost glorified "agricultural science," if the untaught Hungarian peasant, the recently freed Russian serf, the semi-civilized Chinaman, can raise, with no advantage of soil and climate, a larger product from a given area than the comparatively educated farmers of the United States? Judged by the standard of crop production alone, we might almost say that agricultural science is a failure. But is this the real test of the true value of science? By no means. Great as has been the accomplishments of science in the material world; glorious as are her victories over the forces of nature; it is in the intellectual and moral world where she has seen the greatest triumph. This is particularly true in the relation of science to agriculture.

Science has made farming an intellectual pursuit. It has elevated it from a calling which only required and rewarded inferior capacities, to one that demands the amplest knowledge of nature's laws and the noblest efforts of the human mind. If science has not always made better farmers, she has never failed to make better and broader men. It is not knowledge only, but an intellectual awakening that has been and is most needed by the tiller of the soil. This science gives. Science has taught the farmer that this is a world of law; that each event in nature is the logical sequence of the event which preceded it. He no longer has faith in signs, omens, and portents. Science has developed his reasoning power, and this leads him not only to observe an experiment but to divine causes, to apprehend relations, to construct theories, and draw conclusions.

Men may, often do, think and reason upon various social, political, and religious questions, but the conclusions cannot be verified. How different is science. Nature herself answers nature's problems. The facts, ideas and theories of science may be compared to the different forms of organic life. There is the same "struggle for existence," and the same "survival of the fittest." Nothing but truth can exist. Whence comes this signal and far reaching advance in morality so well seen in rural life? Drunkenness, gambling, licentiousness, are far less common than they used to be. One cause of this, I am sure, is the fact that science has laid bare the dire results which inevitably flow from such vices. It enforces as nothing else can do, the truth of the biblical saying "Whatsoever a man soweth that shall he also reap."

Science has made country life sweeter, cleaner and more self-respecting.

Gentlemen of the Society for the Promotion of Agricultural Science, I take it for granted that you all believe in the intimate relation that science bears to agriculture; that you are satisfied of the importance of scientific research to the practical operations of the farm and garden. If satisfied of this you must also be satisfied of the importance of spreading a knowledge of the results of such research especially among practical farmers. As its name implies, the object of this Society is the *promotion of agricultural science.* To what end shall agricultural science be *promoted?* Are there not at least two objects we should keep constantly in view? The first is the improvement of the agriculture of the country, and the second is the elevation intellectually, morally, and socially of the whole agricultural community. It will take time to accomplish these objects, but if these results are not realized in the end, we may reasonably conclude that we have been deceived and that science is really of no use to agriculture. In an age when every child may be fairly educated, if he will, there ought to be more fruit gathered from the tree of knowledge and science.

Is it not possible to make this society truly representative of the agricultural science of our age? Shall we not have an organization which will incite thousands of the aspiring, ambitious youth of our country to take a livelier interest in the great art of agriculture and impel them to gain a more perfect mastery of the sciences which minister to its improvement and efficiency? I trust that those of us who love agriculture and the sciences pertaining thereto, will try to realize that this society ought to be one of the strongest, grandest organizations in the country. Let us intelligently resolve to do our part toward making it what it might and should be.

NOTES ON MASSACHUSETTS APPLES.

BY H. M. SESSIONS.

This subject was assigned me for this occasion, we conclude from the fact that we have spent the past three months in Massachusetts, where we lived over fifty year's in the house in which we were born. During these three months occurred the harvesting of one of the largest apple crops ever grown in New England. And the quality was superior. The accusation of a western man 30 year's ago, while examining our exhibit of apples at the Hampden County Fair at Springfield: "That he never saw a New England apple but what had a worm in it," is certainly not true this year; if for no other reason than that there are far more apples than worms. Not worms enough to go around. The apple crop is so large that they are left to perish on the ground for want of pickers, or a market in which to sell them.

We attended the Hampdon County Fair, whose county seat is Springfield; where for thirty years, before 1880, we used to exhibit over seventy-five varieties of apples, besides grapes, peaches, plums and quinces.

This brings to mind the fact, that perhaps the best way to interest and profit this meeting of the Society, will be to read a paper prepared for another occasion, in which is embodied our experience in cultivating the apple, for fifty years in New England.

While this paper was prepared especially for the hill farms of Massachusetts, it will apply equally as well to the hill farms in many parts of Ohio.

CULTIVATION OF THE APPLE—HISTORY.

The apple is a native of both Europe and America. Many varieties of the crab, from which our improved varieties originated, are found growing on both Continents. In Oregon, the natives use the native crab apple, the size of a cherry, as an article of food. Most of the improved varieties are the result of accident, or rather accidental crossing. As is well known, the new varieties of our fruits and vegetables are obtained by either the artificial process of mixing the pollen from the stamen of the blossom of one variety, with the pistil of the blossom of another variety; and from the seeds of this fertilized fruit, new varieties are expected. Yet how often are our expectations disappointed, for it has been shown by Dr. Bull, of Concord, Mass., who originated the Concord grape, that perhaps only one plant in a thousand, will be any improvement upon the old varieties. Most varieties of the apple flourish best near the vicinity where they originated. Thus the Baldwin, Greening and Russet, flourish better in New England than the Northern Spy, Newtown Pippin and Spitzenberg, which prefer the rich lime soils of the west, where they originated. Over 900 varieties of apples are found in the gardens of the Horticultural Society, London; and over 1,500 varieties have been tested there.

It is generally considered that apples grown on the fertile lands of the west, though large and fair, are yet inferior in flavor, to those grown on the strong, gravelly and sandy loams of New England. Apples grown on such soils, on our mountain farms, will also keep much longer than those grown on the alluvial and bottom land soils of our own valleys.

REMINISCENCE.

We well remember the supreme satisfaction we expressed in our boyhood, when perched in the crotch of the old early-sour tree with hands and pockets full, we ate the luscious fruit; or, when running from tree to tree in the dewy morn, gathering the early apples, that had fallen through the night; and the fun and frolic when returning down the steep side hill, homeward bound—when, either by chance or design, on the part of some roguish one, the basket was upset; and then the lively chase to gather up the apples before they all reached the foot of the hill.

It does seem as though those apples were superior in flavor to any of the improved varieties of the present day. We well remember the early-sours, sugar-sweets, striped-sweets, catheads, which our youthful tastes pronounced perfect; yet would now be ranked only as third-rate apples.

PROPAGATION.

In 1840, at the age of twelve years we were encouraged by our father, to commence raising and propagating fruit-trees in our garden nursery, and it was continued on a small scale, until the farm was stocked with trees.

Here we learned that stocks for the nursery should always be seedlings, and grafted or budded when about the size of the scion, or only a little larger. Grafting on roots or suckers from old trees, produce a stock of feeble constitution, early maturity and of little value, during its short life. Such stocks are more prolific in throwing up suckers around their trunks, than in yielding fruit. Several such trees have passed away on our farm, and their places filled with others of stronger constitution.

We had over 800 trees set on twenty acres of land; most of which have been raised on the farm, and have been set from thirty to forty years. A few were set in 1840 with a slight exception, none of this land has been cultivated since the trees were set. Before setting, the land was thoroughly ploughed and enriched, and underdrained where necessary; cleared of loose stone and seeded to grass, bushed and rolled; after this, the stakes were set two rods apart each way and holes dug, as hereafter described.

These lands have been mowed ever since the orchard was set; though later we pastured them with sheep and young cattle. This plan has been followed the past fifteen years, since we sold the farm.

A top-dressing of manure or ashes, has been applied every other year. It is wonderful what a change will be made in the quality and quantity of the fruit produced by a slight application of ashes under the trees as far as the limbs extend. Orchards need fertilizing as much as other farm crops.

We can rotate our grain, hay and root crops to fields fresh with material to grow that special crop; but we cannot rotate the orchard; it is a fixture; and soon exhausts the soil of the special element, that makes fruit grow; and the farmer must supply that element, or his fruit is inferior, or none at all.

Stable manure is good for the growth of wood, and potash for the growth of fruit. No one expects to grow a crop of corn for thirty or forty years on the same land without manure; then why impose on the orchard and require it to produce a crop for thirty or forty years without fertilizer?

Its like making brick without straw.

Trees on rich ground, or stimulated with too much manure on cultivated land, often make so rapid a growth late in the season, that the wood is not properly matured; such wood is often winter killed, and scions set from such growth, are sure to die; such scions that are enfeebled by the frosts of winter, can be known by the brown color of the pith towards spring.

In selecting a site for an orchard on our mountain farms, we should choose a southern or eastern exposure, if possible; but *any* land, with a strong, dry soil, or moderately moist, will answer all purposes. Avoid a wet or hardpan sub-soil, unless thoroughly underdrained. On any land suitable for raising corn, apple trees will flourish, with the exception of low and rich bottom land. So small a proportion of our mountain farms are suitable for cultivated crops, that it becomes a matter of necessity, if we have orchards at all, to put them on land so hilly or rocky, that they cannot with profit be cultivated; and consequently for the same reason, if we set our orchards on such land, we cannot cultivate them. If we set our best land suitable for cultivation to orchards, we *can* cultivate them; but we have no such land to spare for an orchard. Hence, we are driven to these alternatives—we must go without our orchards, or set them on land that we cannot cultivate; for if we attempt their cultivation, it is at the risk of their washing, year by year, into the valley below.

MANAGEMENT.

Then the question arises, how shall we manage orchards on such lands? Evidently we cannot cultivate them; yet by mulching and top-dressing we promote a suitable growth of well ripened wood. That orchards must always be cultivated, prevents many from commencing what they know to be a herculean task on our mountain farms. The cultivation of orchards is often carried to extremes, doing more injury than good. The land is ploughed and ploughed, and croped without manuring the trees; and ploughed so deep near the trees, that most of the roots that get any nourishment and warmth from the surface soil, are destroyed from year to year, as soon as they attempt to extend themselves to perform their office work. Some crops are more injurious to raise in an orchard than others. The late A. J. Downing stated that a crop of rye would ruin any orchard under twenty years of age. Where the soil is adapted to the apple, or where an annual supply of nourishment is deposited under the trees by cattle, or washings from the hillsides in the spring, or during heavy showers, the apple will live and flourish, and produce large crops, for nearly a century. We have cut down seedling apple trees in such a locality, from two, to three and one-half feet in diameter, They were old trees, when my father first came on the place seventy years ago. Some of these trees have produced forty and fifty bushels in a year. The tops of several of these trees were changed by grafting some thirty or forty years since. They produced several large crops, and then limb by limb from its own weight, fell to the ground, for want of strength in the old stock to support the superabundant growth of wood and fruit.

We have long since come to the conclusion that grafting old trees does not pay; even if the grafting is successful, and large crops are produced for several years; the cost of picking apples on a thirty or forty foot ladder, will amount to more than the crop is worth in market.

The late Hon. George B. Loring, of Massachusetts, formerly United States Commissioner of Agriculture, claimed for the apple tree, a *short* life, and a *merry* one; on the ground that high cultivation; while it shortened the life of the tree, it produced more and better fruit, while it lived; and with the present facilities for obtaining trees and setting more orchards, it did not pay to encourage long lived trees, and use long ladders in picking the fruit.

TRANSPLANTING.

In the latitude and soil of New England we prefer the early spring-select trees with thoroughly ripened wood. Prune severely to balance the loss of roots, cutting back each branch, at least one-half of the last year's growth of wood. Our orchards were set thirty-three feet apart, each way; forty feet would have been better. Trees to form a perfect head, require light and air from all directions, and if set too close, will grow upwards, like forest trees, to get at the light and air, while the lower branches die and drop off. Forest trees in the open field, form a perfect head, as well as fruit trees, with branches and foliage to the ground; so on the edge of the forest, we find the limbs reaching far out horizontally to catch the breeze; while in the dense forest, only the top-most branches grow and thrive, and are ever reaching upwards to the sun and light, it being a wise provision of Providence to supply tall timber trees for the wants of man. Having set the stakes two rods apart each way, the holes were dug from two to three feet wide, and one and a half feet deep. The surface soil was used in setting, and the sub-soil spread over the ground. Sufficient rich earth was brought to fill the holes. Set the trees about the same depth, as in the nursery. Carefully spread the roots out horizontally, inclining downward slightly; not allow them to interfere with each other; cutting off all bruised and broken ends with a sharp knife, to facilitate the starting and growth of new fibrous roots. We use no water, only to thoroughly wet the roots by sprinkling, after placing them in the ground, and before filling, so that the fresh earth will adhere to the tender rootlets, while the hole is being filled. Press the dirt firmly around the roots with the hand while filling, and tread the soil gently down with the foot, when the hole is filled.

PRUNING.

The pruning of the orchard can be done anytime when the sap is dormant, and anytime in the early summer after the leaf is fully formed and the bark will not slip while cutting off the branch; and then the descending sap will begin at once to heal the wound. The pruning should begin as soon as the tree is planted in the orchard. If attended to in season and done in a judicious manner, no instrument need be used for the first ten years, larger than a pocket pruning knife with a hooked blade; but if neglected, the saw must be used to remove the surplus wood and a coat of paint applied; but never prune when the buds are opening and the sap bleeds. In forming the head, only three or four lateral branches should be allowed to grow with the leading upright shoot. This leading shoot, may be removed in upright growing trees, as the Northern Spy, Lady-apple, Early and late Strawberry and others; but never from those with spreading top, or horizontal growers, as the Greening, R. Russet, P. Sweet, Gravenstein, etc. We think those varieties with round heads, as the Baldwin, Nonesuch, etc., are not improved by cutting out this leading shoot. No invariable rules can be laid down, in regard to pruning; yet we learn to remove all limbs which cross or interfere with each other, are so near above each other that, if loaded with fruit or leaves, will rest on, or chafe the one below. Limbs should be removed where so thick as to exclude the air and light. The first set of limbs should be at right angles with the trunk, and radiate from it like the spokes of a wheel. The next set should not be directly above the first, but alternate with them, so that, if loaded with fruit, it would rest upon two limbs, and not interfere with anyone below it, as would be the case if directly above. Like the old stone-wall-layer, who when asked how he laid wall, said, he did not lay *one* stone upon *another*, but *one* stone upon *two*. All dead wood, and such lower limbs that show signs of failing by being overshadowed, should be removed. In forming the head for orchard trees, we should not allow the lower limbs to start out less than five or six feet from the ground, and at that distance they will rest upon the ground, when grown and loaded with fruit.

There are three or more objects gained by judicious pruning. First, larger fruit; second, by letting in the sunlight and air, fruit of much higher flavor and color; and third, greater ease and convenience in gathering the fruit.

INSECTS.

Besides the curculio, the tent catapillar is the only enemy with which we have had to contend. Brushing off the nests with a spiral brush on a pole is not effectual, many are left, to continue their work of destruction. Shooting them with powder, or burning them with torches, kills the bark, and ruins the growth of the limb. But we have always been successful when we charged upon him in season, and taken him unawares, when in camp. The only sure and effectual remedy, is to attend personally to his case, with ladders—stripping off the nests and all their occupants from the tree with the *hands*, and stamping them under the foot. The borer has never troubled us, only on a few quince bushes.

HARVESTING.

Apples for the market should *always* be picked from the trees by hand. If winter apples, they may be kept in open barrels, or bins, in the barn or sheds, until in danger of freezing; then barreled up, and put in a cold, dry cellar, and kept as cold as can be and not freeze.

The following is a list of sweet and sour apples that ripen in succession the year round: Sour, Early Harvest, Red-Astrachan, Gravenstein, Portor, Nonesuch, Greening, Baldwin, Russet, Sweet Bough, Golden Sweet, Pound Sweet, Danvers Sweet, Ladies Sweet.

CERTAIN TROUBLESOME DISEASES OF TOMATOES AND CUCURBITS.

BY AUGUSTINE D. SELBY, WOOSTER, OHIO.

The gardener who raises tomatoes, cucumbers and melons largely, will not take kindly to any added difficulties in their production. For the cucurbits, in past seasons, there has been quite trouble enough to keep off the cucumber beetle and squash borer, while tomatoes have been fairly free from fungous troubles, in Ohio. Within, about two seasons, there has appeared a leaf blight of nutmeg melons, a species of Alternaria, which promises to be a serious drawback to their culture. For cucumbers, I have noted downy mildew in 1895 and in 1896, and in 1896 the cucumber spot for the first time in the observation of the writer, while the anthracnose has spotted water melons very extensively this season.

A tomato leaf blight fungus has proven quite destructive in several localities during the season; anthracnose of the fruit has likewise appeared in the state.

When your Secretary asked for a contribution, it seemed, therefore, appropriate to speak upon the more serious diseases of tomatoes and cucurbits.

DISEASES OF THE CUCUMBER.

In common with, squashes, pumpkins, watermelons and nutmeg melons, cucumbers suffer from a bacterial blight, the organism of which Dr. Smith[1] has named *Bacillus tracheiphilus*. The symptoms of the blight are sudden wilting as from lack of water. Such collapsed plants show a moist watery appearance of the inner stem tissues near the surface of the ground. The inoculation of healthy plants has been shown to be brought about by the cucumber beetle (Diabrotica) and the squash bug (Coreus). No remedy has yet been put forth for this trouble. To avoid following one susceptible crop by another, is founded upon established principles. Burning affected plants, as discovered, decreases chances of infection.

The downy mildew of cucumbers, *Plasmopora Cubensis*, (B. and C.) has become general, in eastern gardens. It has been sent to the Station for two years, from greenhouses near Cincinnati, where cucumber forcing is practiced. It was also found in my own garden at Wooster. The trouble is likely to be general, while more prevalent in greenhouses. The fungus grows upon the under leaf surface, producing the downy growth which

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(1). Proceedings A. A. A. S., 1893. Botanical Gazette September, 1893. Centralblatt fur Bakt. u. Parasitenk. Zweite Abt. I, 364, (1895).

characterizes this genus. Upon the upper surface, the leaf turns yellow in rather large angular spots, following the leaf venation. In New Jersey, fair promise of success in spraying for mildew with Bordeaux mixture is reported.

The cucumber spot, *Cladosporium cucumerium*, (Ell. and Arthur), upon the fruit, described by Dr. Arthur[2] several years ago from Geneva, New York, where it ruined the crop for pickling, has come from Mahoning county in 1896. The appearance of the cucumbers is, perhaps, more damaged than the flavor. The pickle growers will find this disease a serious drawback.

The fungus of the spot is rather superficial and should be amenable to fungicides.

Another disease of the fruit of the cucumber, the anthracnose, *Colletotrichum lagenarium*, (Pass.,) prevails in New Jersey where it is described[3] as "probably the worst fungus enemy to cucumbers in the state." It causes serious decay of the cucumbers. The same fungus attacks the leaves of cucumbers and musk melons. It is likely to be found with us since this fungus is already spotting beans and attacking watermelons. Dr. Halsted's Report for 1895[4] gives encouragement to spraying with Bordeaux mixture for both the anthracnose and the downy mildew of cucumbers.

The leaf blight fungus, *Alternaria*, (Sp.,) of nutmeg melons has not yet been found upon cucumbers.

DISEASES OF NUTMEG MELONS.

The bacterial disease of nutmeg melons has been discussed under cucumbers. A new leaf blight of nutmeg melons has appeared and has proven very destructive. The fungus associated with it appears to be a species of Alternaria, possibly that called by Peglion,[5] *A. brassicae* (Berk.,) f. *nigrescens* (Pegl.,) This, is, evidently, the same disease mentioned by Smith,[6] as occuring in southwestern Michigan in 1892. Nutmeg melons, at the Experiment Station, Wooster, suffered severely the past season. The plants were, practically, all dead before frost came, and with shortening of the crop.

It is expected to furnish illustrations of this trouble for publication. (See Plate.) The fungus causes many rather large, dead areas in the leaves, followed by dying back and curling under, from tip and margins. The last green portion remain-

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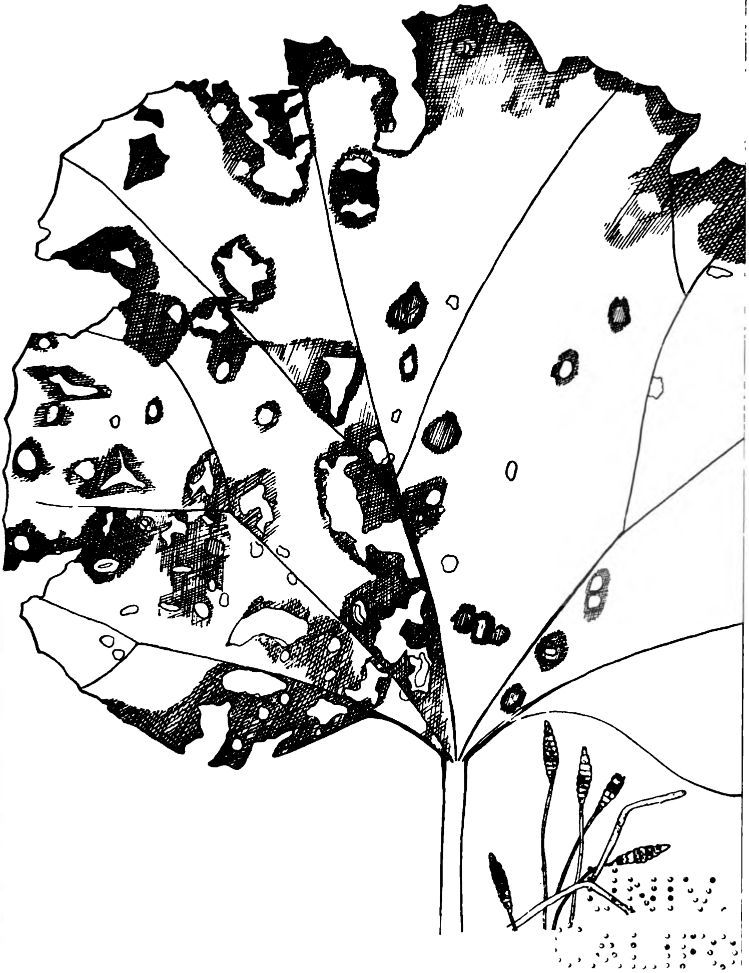
(2). Bulletin 19, Ind. Experiment Station, 1889.

(3). Halsted, Dr. B. D., Report of Botanist, N. J. Exp. Sta., 1894, p. 34.

(4). Report Botanist of N. J. Exp. Sta., 1895, pp. 304-5.

(5). Peglion V., Contribuzione alla conoscenza della flora micologica avellinese. See Zeitsch. fur Pflanzenk., V. p. 293, (1895).

(6). Smith E. F. Journal Mycology VII, p. 373 (1894). See also, Bot. Gaz., Sept., 1893.



SELBY ON MUSKMELON LEAF BLIGHT.

ing, is near the petiole. This leaf blight may not appear as early as the bacterial disease but promises to be very destructive, in its season.

Spraying with Bordeaux mixture, for the prevention of leaf blight, may be undertaken with promise of success.

Elsewhere, the anthracnose has affected nutmeg melons, but I have not met with it.

WATERMELON ANTHRACNOSE, ETC.

The anthracnose fungus of the watermelon is identical with that of the bean and cucumber, *Colletotrichum lagenarium*, (Pass.,).[7] In cases of severe attack, the anthracnose leads to decay of the watermelons. As seen this season, the spots were chiefly small and the damage accordingly less. The watermelon also suffers from attacks of *Bacillus tracheiphilus*, Smith.

DISEASES OF TOMATOES.

During the dry seasons of the past, much complaint was made of the black rot of green tomatoes at the tip. The same trouble comes in the greenhouse from insufficient surface watering, while portions of the same bench, near by, where subirrigation is practiced, may be practically free from the black rot. This was observed, in the Station greenhouses, in 1895. The past season has furnished no cases of complaint from black rot outdoors. The conclusion that insufficient water supply is, in part, responsible for this rot, is suggested by the observations above given. *Macrosporinm tomato*, (Cke.,) is accredited with an important part.[8] The pink incrusting mold, *Fusarium solani* (Marx.,) sometimes assists in tomato decay.

The anthracnose fungus of tomatoes, *Glœosporium phomoides*, (Sacc.,) is a serious enemy. In the later summer it spots the fruit before it matures. In the ripe tomatoes, the spots are not especially conspicuous, although evident enough to be readily perceived. The fruit attacked before maturity, may be, and is likely to be seriously damaged, if not altogether destroyed through subsequent decay. The disease was noticed during the summer just past, in the Station Garden at Wooster. While not prominent there, it is liable to become generally prevalent before the lapse of many seasons. Spraying with Bordeaux mixture reduced the decay of fruit one-half[9] in 1895 at the New Jersey Exp. Station. The spotting of tomato leaves, in a manner similar to that occurring upon potatoes suffering from early blight, and due, apparently, to the same fungus, *Macros-*

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(7). Halsted, Report of Botanist, N. J. Exp. Sta., 1893, pp. 347-351.

(8). Scribner F. L., Report U. S. Depot Agric., 1888, pp. 339-344.

(9). Report of the Botanist N. J. Experiment Station, 1895, p. 296.

porium solani, (E. and M.,) has been known among tomato growers for sometime. The tomato leaf spot is not usually injurious, in a high degree.

The tomato leaf-mold, likewise due to a fungus, *Cladosporium fulvum*, (Cke.,) is more common in forcing houses, if not confined to them, with us. The fungus, commonly grows upon the under side of the leaf surface, exhibiting an olive color in the affected areas; later, these patches turn yellow and finally brown, and the leaf breaks in pieces. The remedy is to be sought in prevention, by fumigation, etc., and in spraying.

The new leaf blight of tomatoes has recently reached us, although Dr. Halsted has found it in New Jersey for at least three years.[10]

It is, like the others, produced by a fungus, *Septoria Lycopersici*, (Speg ?), which first attacks the leaves and later the stems, but damaging through destruction of foliage, chiefly. The illustration will show the character of injury in so far as this may be shown, by a simple leaf illustration.

The terminal or end leaflet is first attacked, having numerous, small spots, ⅛ inch in diameter, or less. These are ash gray in color when viewed from below, which is the direction of attack. The lower leaflets, leaf stalks and finally the stems are spotted and blighted. The tomatoes in the Neil Ave. Garden here in Columbus suffered from leaf blight during the past summer; it was previously observed in the "pathological" Garden at the Station and in the tomato fields near Marietta. At the latter place, complaint was made of serious loss and shortening of crop on early plantations. If growers where the leaf blight has prevailed, during past seasons, strive for the early market, treatment for it will become necessary. Bordeaux mixture has proven a remedy for it, but must be applied before the injury is wrought, to be effective.

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(10). In letter October, 1896.

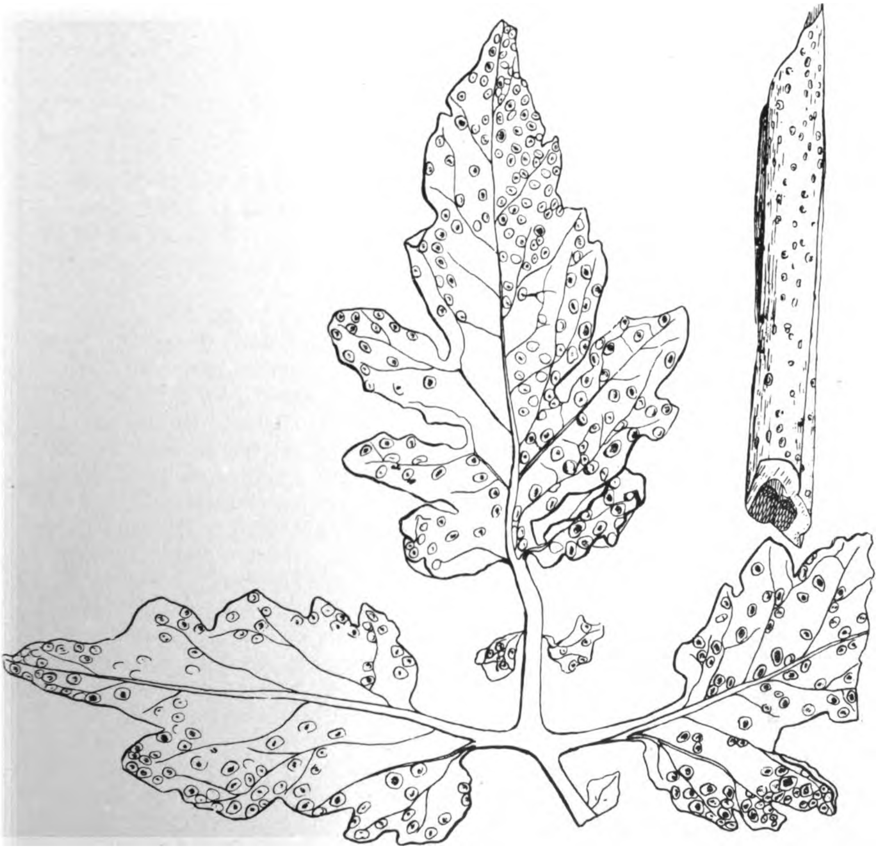
EXPLANATION OF PLATES.

PLATE I.—Affected leaf of muskmelon. Natural size. Spores of *Alternaria* x 53.

PLATE II.—Stem and leaf of tomato with leaf blight, *Septoria lycopersici* Speg. Natural size.

Both plates from drawings by Miss Detmers, made for Ohio Experiment Station.

Journal Columbus Horticultural Society, Vol. XI. Plate II.



UNIV. OF CALIFORNIA

SELBY ON TOMATO LEAF BLIGHT.

THE CHRYSANTHEMUM.

BY E. C. GREEN.

In a very important respect, the subject Chrysanthemum resembles that of electricity, in that while it is not new, the recent developments have been so marked as to change it almost completely in the last few years, so that anyone who knew the Chrysanthemum of a decade ago would scarcely know it now, so changed it is.

In 1888 Japan sent us a novelty in this flower, which marked a new era in its culture. This variety was the Mrs. Alpheus Hardy, one of the hairy sorts, for which the large sum of $1,500 was paid. Extensive advertising of this sort with others stimulated such an interest in the Chrysanthemum, that now we have from two to three thousand varieties that are recognized by the florists and each year they send out many new kinds to swell that list.

In the manner of propagation there has been as great change as in the form and color, from being a hardy plant left out to stand the winter's cold and storm, they have become the pampered pets of greenhouses, being forced, fertilized and disbudded and given all the care and attention the modern skilled florists know how to bestow, so that a person familiar with the little pompons would not recognize them in their changed form.

Yet there is some excuse for all this for there is perhaps no flower that has a larger variation in form and color than the Chrysanthemum, and this is what gives an interest to their culture, an interest that will not be lost until the range of variation be found, for indeed there must be a limit to the different kinds that can be produced.

Another thing which adds to their popularity is the season which they occupy, coming as they do in the fall of the year, they brighten up the melancholy days without the suggestion of decay as is given by the beauty of the falling leaves.

In the matter of form, to give only those most prominent, we have the Incurved—Reflex—Anemone—Pompon—these forms are made to assume a remarkable number of sub-forms, being combined and rearranged until the number of names given to them is almost too much for modern cataloguing to stand.

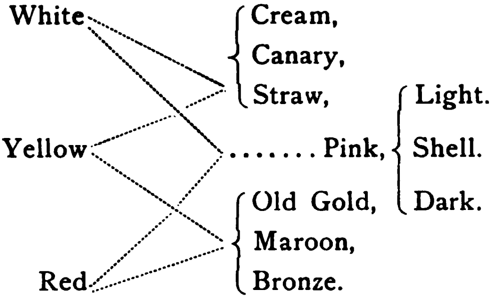
The short and close florets of Pompons are found in the enlarged flower of the Anemone, with the ray floret developed to an unusual length, which comprise the entire flower of

Incurved and Reflex, curved, lengthened and twisted in most remarkable manners.

Then the color gives another scope for variation, while as in other flowers the range of colors only include a certain number, yet the shades, tints and variegations, blending from one color to another, the coloring of one side of a floret one color while the reverse is another, which changes the color of the flower almost entirely as it opens, make an interesting sight not to be forgotten.

It seems as if nature would almost break her fixed rules when it comes to coloring the Chrysanthemum, but so far no grower has succeeded in raising a blue one.

The standard colors seems to be but three, but unite in different way to form other tints, something as follows :



But the names in colors are so very indefinite that what seems one thing to a certain person may mean something else to another, yet the combination and arrangements are so great in the Chrysanthemum, that there is some excuse for the different names.

The whites are clear and pure, but its combinations with yellow, vary so much that it is not possible to say just where the distinctions lay between the straw or canary, or any of the minor colors.

The yellow is decided and clear, but the red is an indefinite quality and can hardly be called a distinct red.

The mixtures of colors are more common than the colors themselves. The pink, a combination of the white and red, can almost be called a staple color, the variations being numerous and popular.

So with the variations of form and color, it is no wonder that the number of named sorts are legion, and each season brings a fresh supply ; for each grower seems to think it incumbent on him to drop the older kinds and add new ones. Perhaps it is from this fact that we have not as yet a standard sort. In all fruits and flowers, if there were dropped from the list a half a dozen of the prominent kinds, the grower would feel the loss greatly, this is particularly true of those who grow for a commercial purpose; but with the Chrysanthemum the standard of excellence is so well filled with so many kinds that a loss of a few would hardly be felt, as more of equally good points would fill their places. But this will undoubtedly be changed, for the law of the "survival of the fittest" will be applied and those kinds that have but a few points of excellence, be dropped from the list; although climatic changes and influences of soil will always as in other things be in the way to anything like an entire uniformity. For this reason any attempt to name the best varieties even for a given locality would not be satisfactory, yet a few of the prominent ones would not be out of the way here.

Among the white varieties the Queen and Niveus are well known, and the old Ivory as a pot plant comes as near being a standard as anything.

The Major Bonnaffon, Eugene Dailledouze, Golden Wedding are yellow varieties of prominence.

In the pink Mrs. E. G. Hill is a very fine one of early blooming. Lillian Bird and Laredo are good in their particular place.

Geo. W. Childs is one of the best of dark bronze reds.

But a selection from the list of any grower would likely give satisfaction; bearing in mind however that those in the novelty list, no matter how highly praised, are less liable to be the best, either in plant or flower, but a selection from those in common use will do better.

DISCUSSION.

Prof. Lazenby—Speaking of colors, we are not likely to have more than three developed in any one kind of flowers. With roses we have red, white and yellow, with intermediate shades. Mr. Green has just shown that the same is true of Chrysanthemums. In Hyacinths the colors are various shades of red, white and blue.

Prof. Kellerman—Why is the demand for Chrysanthemums so great at this season?

Mr. Green—They are the only flowers produced in quanity for the November market.

PARASITIC FUNGI ON OHIO WEEDS.

BY F. L. STEVENS.

That the cultivated plants have enemies is evident to the farmer, gardener or horticulturist without demonstration. It may be the animal of nightly depredation or an insect of constant presence either large and easily evident or almost microscopic in size. In either case the effect of an attack is usually far easier seen than is the attacking individual or hosts. That animals are the enemies of plants has long been evident to the practical cultivator, for the evidence has been clear before him, and from long custom his mind has become habituated to regard all disorders of his cherished crop as the result of either insect invasion or a direct visitation of providence (corrupting the last word to a somewhat negative sense).

But with the advent of the experiment station and the circulation of the bulletins the public becomes aware that for the blight and the rot there is as definite, clear, distinct and evident cause, visible to the eye when assisted by the microscope, as there is for the trampling of the corn when the fence is low or the defoliation of the elm when the beetle comes. Diseases of plants seem more abundant to the cultivator now than before. Every crop has its enemy. Treatment for prevention is imperative. If the orchardist or vinyardist wishes to insure success he must spray. The grower of wheat must treat his seed. Care must be taken that a crop follows not upon the field of one related to it which bore disease; and many other rules are to be followed unheard of in the early part of the century. Surely there are diseases in this country of both plant and animal never known here before. In like manner has our source of supply been augmented. New crops, methods and machinery are at hand so the increase in the ranks of the enemy may not be disproportionate. And does not the spraying of the apple bring a finer, fuller and richer fruit than the unsprayed tree of your youth knew?

Man's attention is drawn naturally to the diseased condition of his crop so carefully tended, and the smut in the oat, the scab in the apple or potato, the blight of celery or club root of cabbage or turnip are readily apparent. Why should these be damaged? Still more the question, "why should these be damaged and the weeds be passed unharmed?" And often we hear the bitter statement that "The weeds are all that are left this year without disease." Are the weeds thus exempt?

No. The reasons their troubles pass unnoticed are apparent. They are of little interest. They do not have the cultivator's sympathy and they might swarm with lice or be blighted to death unnoticed. Then again the observing careful farmer has few weeds to make observation upon, while the man who has a farm of a rich growth of weeds is not the one to notice their little ills.

A little careful attention and study will disclose the fact that weeds are no more exempt than any other plant. Fungi abound on them and often in quantity. And if one were to undertake to grow Burdocks or Thistles as a crop he would find them worse besieged than are potatoes and corn.

Fungi, as may be said of almost any other class of beings, are not universally bad. Some are bad, some are good and some combine both qualities. Of the parasitic fungi which take their nourishment from other plants some injure valuable plants, others tend to destroy the weeds and some attack both weed and crop. Their presence is known to the eye rather by the effect than from the view of the fungus itself and either they or their effects would be variously known as cluster cups, powdery mildews, white moulds, blights, white smuts, smuts, moulds and rusts.

Whether a fungus growing parasitic upon a weed is a desirable thing from the point of view of the cultivator depends upon several considerations. The fungus may kill the weed, it always tends to decrease its vitality. Hence, it is good. The fungus may grow upon the cultivated plants as well as upon weeds, if so its increase and multiplication upon weeds is bad as it increases the danger of infection. Again, although the fungus may not grow on cultivated plants in the form known upon weeds, yet in some other form it may do damage to a crop.

A fungus undergoes a metamorphosis which may be compared to that passed through by an insect in going from the stage of caterpillar to butterfly and which enables the fungus to pass one period of its existence with one form and appearance, then to pass to another plant and take up another entirely different appearance. For example the barberry bush may nourish and sustain one stage of the common wheat rust known as the cluster cup stage and thus favor its spread. The cedar furnishes food to the cedar apple which later appears as a rust upon apple leaves.

Before being able then to tell whether a fungus is on the whole good or bad, we must know upon what plants it is capable of feeding in each of its stages of growth. Regarding a few fungi such knowledge is possessed and the information is such that one is led to believe that many if not most fungi have three forms; but unfortunately the vast majority have not yet revealed their life histories to men. Until the secrets of their histories are sought and found we shall not know whether the apparently friendly blight of the Burdock or Smartweed may not be an immediate parental relative of the rose leaf spot or of some disease of another equally valued plant. Thousands of forms of fungi are known whose connection with other forms is no more than suspected. Years of investigation are needed to reveal with certainty the relations existing. Only careful and accurate scientific research can solve the questions. So although we can list weed fungi and show the damage done by them to the plant which they are upon, we must also consider the known or possible relation which this fungus bears to cultivated plants as well.

Considering alone the question of direct injury done to the weed by fungi it may be best to distinguish five cases:

1. Direct destruction of green parts.
2. Interference with root functions.
3. Destruction or injury of seeds.
4. Destruction or injury of flowers.
5. Injury to stems resulting in weakened vitality beyond point of attack.

Analysis of these five divisions is hardly necessary. The general vitality of the plant depending upon its green color anything which destroys or diminishes this does damage whether it be a general blanching of the leaf or a blighting in spots, so much energy accumulating chlorophyll is gone and in just that proportion to which it is destroyed so is the plant injured.

Gall producing fungi upon the roots prevent proper absorption of nourishment and tend to weakened or distorted growths. Seeds may be rendered totally functionless as in smut of various plants or may convey disease from generation to generation of offspring perpetuating the weakness as in the case of the bean anthracnose. In the flower or stem serious damage is less common but the nature of damage in such structure is apparent.

Fungi are sometimes known to be present in quantity sufficient to exterminate the host as for example a colletotrichum mentioned by D. G. Fairchild upon a Live-for-ever. The rust upon the Canada Thistle often nearly kills the plant. This has naturally led various experimenters to attempt to artificially innoculate the thistle in the field with the rust, that the disease might spread to the complete destruction of the pest; but such experiments have never been attended with any great degree of success.

In the following list are included but a few of the most conspicuous of Ohio Weed Fungi yet the list embraces seventy-nine species all doing more or less real injury to the host it is found upon. Only the latin or scientific name can be given with accuracy since the fungi are so inconspicuous that they are almost totally unknown by common names.

	FUNGUS.	HOST PLANT.
1.	*Æcidium asterum, Schw.*	Asters.
2.	" *compositarum*	Wild sunflower.
3.	" *euphorbiæ Gmel.*	Wild euphorbia.
4.	" *œnotheræ, Pk.*	Evening primrose.
5.	" *sambuci, Schw.*	Elderberry.
6.	*Albugo amaranthi, (Schw.) Ktz.*	Pigweed.
7.	" *candidus, (P.) Ktz.*	Cress family.
8.	" *portulaceae, (P.) Ktz.*	Parsley.
9.	" *tragopogonis, (P.) Gray.*	Salsify.
10.	*Cercospora œthæinæ, Sacc.*	Mallow.
11.	" *arcti-ambrosiæ, Hals.*	Burdock and ragweed.
12.	" *armoraceæ, Sacc.*	Horseradish.
13.	" *acalypha, Pk.*	Three seeded mercury.
14.	" *sp.*	Black snakeroot.
15.	" *apii petroselina, Fr.*	Carrot, Parsnip.
16.	" *daturæ, Pk.*	Thornapple.
17.	" *dubia (Riess.) Wint.*	Pigweed.
18.	" *elongata, Pk.*	Teasel.
19.	" *flagellaris, E. & M.*	Poke.
20.	" *symplocarpi, Pk.*	Skunk-cabbage.
21.	*Cicinobolis cesotii*	Mildews.
22.	*Cylindrosporum capsellæ, E. & E.*	Shepherds's purse.
23.	*Darluca filum, Cast.*	On rusts.
24.	*Entyloma compositarum, Farl.*	Ragweed.
25.	" *physalidis, Wint.*	Ground cherry.
26.	*Erysiphe cichoracearum, D.C.*	Verbena.
27.	" *communis, (Wallr.)*	Smartweed.
28.	*Macrosporeum cookei, Sacc.*	Thornapple.
29.	" *sapenariæ, Pk.*	Bouncing bet.
30.	*Marsonia toxicodendri, (E. & M.) Sacc.*	Poisen ivy.
31.	*Ovularia obliqu, (Cke.) Oud.*	Dock.
32.	*Plasmopara arthuri, Farl.*	Evening primrose.
33.	*Peronospora alta*	Plantain.
34.	*P. effusa*	Pigweed.
35.	*Phyllachora graminis, P.*	Grasses.

36.	*Phyllosticta ampelopsidis, E. & M.*	Virginia creeper.
37.	“ *sp.*	Yellow rocket.
38.	“ *chenopodii, West.*	Pigweed.
39.	“ *lappæ, E. & K.*	Burdock.
40.	“ *podophylli, Wint.*	May apple.
41.	*Pseudopeziza medicaginis*	Alfalfa.
42.	*Puccinia asteris, Duby.*	Asters.
43.	“ *flosculosorum* (*A. & S.*) *Ræhl.*	Dandelion, thistle.
44.	“ *podophylli, Schw.*	May apple.
45.	“ *tanaceti, D. C.*	Sunflowers.
46.	“ *xanthi., Schw.*	Cockle bur.
47.	*Ramuluria Armoracia, Fk.*	Horseradish.
48.	“ *arvensis, Sacc.*	Five finger.
49.	“ *barbarea, Pk.*	Yellow rocket.
50.	“ *plantaginis, Duby.*	Plantain.
51.	*Septoria agrimoniæ eupatoria R. & S.*	Agrimany.
52.	“ *atro purpurea, Pk.*	Asters.
53.	“ *bacillaris, Wint.*	Ragweed.
54.	“ *brunellæ, E. & H.*	Self-heal.
55.	“ *bromi, Sacc.*	Chess.
56.	“ *convolvuli, Desm.*	Bind-weed.
57.	“ *consimilis, E. & M.*	Wild lettuce.
59.	“ *gei, Desm.*	Avens.
58.	“ *erigerontis, Pk.*	Fleabane.
60.	“ *gramineum, Desm.*	Grass.
61.	“ *helianthi, Ell. & Kell.*	Sunflower.
62.	“ *lactucæ*	Wild lettuce.
63.	“ *lapparum, Sacc.*	Burdock.
64.	“ *lepidicola*	Peppergrass.
65.	“ *malvicola, E. & M.*	Mallow.
66.	“ *œnotheræ, West.*	Evening primrose.
67.	“ *podophyllini, Pk.*	May apple.
68.	“ *polygonorum, Desm.*	Smartweed.
69.	“ *verbascicola, B. & C.*	Moth mullein.
70.	“ *veronicæ*	Corn speedwell.
71.	*Sphærotheca castagnei, Lev.*	Stick tight.
72.	*Synchytrium decipiens, Farl.*	Hog peanut.
73.	*Uredo cæoma nitens, Schw.*	Bramble.
74.	“ *agrimoniæ-eupotoriæ, D. C.*	Agrimony.
75.	*Uromyces euphorbiæ, C. & P.*	Euphorbia.
76.	“ *Howei, Pk.*	Milkweed.
77.	“ *polygoni,* (*P.*) *Fcl.*	Smartweed.
78.	“ *terebinthi* (*D. C.*)	Poison ivy.
79.	*Ustilago utriculosa* (*Niesel.*) *Tul.*	Smartweed.

This list is very incomplete and to draw general conclusions from it might lead to error but a summary may point out some important features.

Sixteen of the fungi are true rusts and each of the sixteen usually does material good in checking the growth of its host.

Four are white moulds and each of these is efficient in retarding growth.

Septoria is the most common genus represented by twenty species or about twenty-five per cent. of the whole number.

While it is a difficult matter to discriminate upon, it may be said that thirty-one or about thirty-seven per cent. are upon weeds which may be considered as being very bad.

Eighteen or about twenty-three per cent. are known to also grow upon cultivated plants.

One prevents the weed from seeding.

A glance over the list may show a few separate species of peculiar interest.

First we find the White Mould, *Albugo amaranthi*, which is to be seen almost everywhere that its host, the *Amaranth* grows. It is found upon many species of the genus and always in quantity sufficient to materially injure the host although it does not prevent it becoming a large plant, nor does it prevent it seeding freely.

Albugo condidus grows upon most members of the Cress family and while it may check the weedy Peppergrass, Mustard, etc., still it will in equal measure injure the turnip, radish or cabbage and, as is also true of number nine, its presence is more to be avoided than desired.

Cercospora althæina and *apii*, producing leaf spots upon Hollyhock and Parsley families are also apt to do more evil than good.

Numbers twenty-one and twenty-three are cases of a fungus growing on a fungus. The first belonging to the genus *Cicinobolis* is not reported for the State before, but seems common on the mildew of the *Verbena*.

The *Poison-ivy* is a plant dreaded by most people, either for personal or altruistic reasons, and any enemy of it should be a common friend of mankind. There are two such which have the additional good feature of not growing upon any desirable plant.

Number thirty-one, *Ovularia obliqua*, seems, ubiquitously and constantly, to wage war, with the genus *Rumex*.

Phyllachora graminis, is common on many grasses cultivated as well as wild.

Puccinia flosculosorum is a species which grows freely upon members of the Sunflower family and among the weeds subsists upon the dandelion and Thistle. Upon the Dandelion it produces the reddish tints seen in the specimens.

Romularia armoraciæ grows in abundance upon the Horseradish as do several fungi.

A Septoria upon *Sanicula* is of interest as it appears to be a species new to science.

Septoria brunellæ upon self-heal may be taken as representing the typical appearance of a fungus upon leaves.

Septoria lapparum is upon the Burdock almost everywhere the latter is and injures it extensively.

DISCUSSION.

Mrs. Lovejoy—I have been troubled seriously this season with mildew of my roses.

Prof. Kellerman—At one time I thought parasitic fungi would eventually destroy most weeds. But I have changed my mind, and now hold to the theory that no fungus is likely to become abündant enough to eradicate its host plant. I think farmers will not get much good out of fungi. Even as common as mildew appears on the cockle bur, I have never seen a plant entirely killed by it.

There are some advantages derived from the existence of fungus diseases. I think better plants are oftentimes a consequence. Carnation rust might be cited as an example. Growers in their endeavor to repel an attack of the disease give their carnations more attention, and the result is a superior flower.

Mrs. O. W. Aldrich—In former years we have been annoyed with grape rot. This year, not thinking it worth while to cultivate the vineyard, as the rot would take the fruit anyway, we allowed the weeds to grow among the vines; with the exception of part of a row, our grapes were ideal. This part of a row was injured by the sun, or in some other way, seemingly because the weeds about it were cut just before the fruit ripened.

FULTON COUNTY BOTANY.

BY JAMES S. HINE.

During the short vacations I have spent in Fulton County, since I entered the Ohio State University in 1888, I have taken some notes on plants found growing in that section. It is with some hesitation that I prepare a paper from these notes for publication, as I entertain some doubts regarding its usefulness. But on the other hand, Fulton County being in the extreme northern part of the state, has quite a different weed flora from the county in which Columbus is situated. Plants that are weeds here are often rare or unknown there and *visa versa.*

Last Summer furnished just the proper conditions for an abundant growth of weeds. They grew so profusely that farmers, in some sections, mowed stubble ground over twice after wheat harvest, in order to prevent the weeds frem choking out young clover. Corn fields, as a usual thing, were weedier than in most former years. The past dry seasons have prevented a perfect "catch" of clover and grass in many sections and the vacant places in meadows thus caused, furnished room for weeds to grow. And fence corners and roadsides required abundance of attention in order to prevent these noxious plants from ripening their seeds.

The nomenclature and arrangement, in the following list, are according to Gray's Manual of Botany, and I shall give only herbaceous plants in the first list, without reference to woody species that might be designated as weeds.

I. Some of the more important weeds.

1. *Arabis perfoliata,* Tower Mustard. This Plant is not common usually, but I saw one meadow in which it was growing abundantly.

2. *Camelina sativa,* False Flax. Abundant in the northern part of the county where it is a pestiferous weed, especially on high, sandy ground.

3. *Brassica sinapistrum,* Mustard.

4. *Brassica nigra,* Black Mustard.

5. *Capsella bursa-pastoris,* Shepherd's Purse.

This weed appears early and is widely distributed.

6. *Thlaspi arvense,* Pennycress, is reported from Swanton by Aug. D. Selby.

7. *Lepidium virginicum,* Wild Peppergrass.

8. *Saponaria officinalis*, Boucning Bet. Not abundant, but where introduced it is hard to control.

9. *Portulaca oleracea*, Purslane, grows abundantly in ground that is cultivated successively. It is hard to control in gardens, and is considered one of our very worst weeds.

10. *Malva rotundifolia*, Mallow, grows profusely around old buildings, and in waste places where the soil is extremely fertile. It makes a rank growth and usually chokes out grass and weeds that come up in its territory.

11. *Sida Spinosa*, grows, in the county, only sparingly along roadsides.

12. *Abutilon avicennæ*, Indian Mallow, grows along roadsides and in barnyards. In these places it is considered a very bad weed on account of its unpleasant odor and appearance. It grows very rapidly at the time of year when farmers are especially busy, and consequently oftentimes ripens its seed.

13. *Impatiens fulva*, Touch-me-not, oftentimes becomes a weed along ditch banks, and in low ground.

14. *Lupinus perennis*, Lupine, grows in fields that are not often cultivated, and along roadsides. This plant is always found on sandy soil.

15. *Melilotus alba*, White Melilot, has become a very troublesome weed, within the last few years. It grows mostly along roadsides and in waste places where the soil is fertile. As far as my observations go, it is a lover of clay soil.

16. *Tephrosia virginiana*, Hoary Pea, grows abundantly in the south eastern part of the county. This plant does not cause much trouble on cultivated ground.

17. *Desmodium canescans*, Tick-trefoil, becomes a weed on roadsides, along woods. Other species of this genus are weeds in similar situations.

18. *Lespedeza polystachya*, Bush Clover, grows abundantly in dry soil on newly cleared land. It is a roadside weed also.

19. *Lespedeza capitata*, appears with the last species.

20. *Potentilla norvegica* Five-finger. Several other species of this genus might be mentioned. *P. canadensis* is the most common one on cultivated ground.

21. *Agrimonia eupatoria*, Agrimony.

22. *Epilobium angustifolium*, Great-willow-herb.

23. *Œnothera biennis*, Evening Primrose.

24. *Pastinaca sativa*, Wild Parsnip.

25. *Triosteum perfoliatum*, Horse-gention, becomes a weed in wood-pastures.

26. *Galium asprellum*, Bed-straw.

27. *Dipsacus sylvestris*, Teasel, grows in pasture-fields, along oadsides and in waste places. It is considered a very bad weed.

28. *Vernonia altssima*, Iron-weed, grows commonly on low ground in fields and along roadsides.

29. *Eupatorium perfoliatum*, Boneset, is a common weed in boggy pastures. It is often used as a preventive and cure for chill fever.

30. *Liatris scariosa*, Button-snake-root, grows commonly on high ground along roadsides and in newly cleared fields.

31. *Liatris spicata*, Blazing-star, grows in the same situations as the last species, but is more common.

32. *Solidago canadensis*, Goldenrod, might be classed as a weed for it grows abundantly along roadsides and on ditch banks. Several other species of Goldenrod are very annoying at times but the reputation of these plants as flowers, prevents one from calling them weeds.

33. *Erigeron canadensis*, Horse-weed, is one of our very worst weeds. It grows profusely on sandy ground, coming up abundantly after harvest, in stubble land where it chokes out grass and clover. Farmers are oftentimes compelled to mow wheat stubble in August, wholly on account of this weed.

34. *Erigeron annuus*, Daisy Fleabane, grows in waste places as well as in meadows, where it is an unwelcome plant.

35. *Erigaron philadelphicus*, Common Fleabane, grows commonly in waste ground.

36. *Gnaphalium polycephalum*, Wild Balsam, growscommonly on sandy soil.

37. *Silphium terebinthinaceum*, Prairie Dock, grows along highways and railroads, preferring medium low ground.

38. *Inula helenium*, Elecampane.

39. *Ambrosia artemisiæfolia*, Ragweed, is our most common weed. If individual specimens were the only proof of a bad weed, this one would surely win the laurel, as it outnumbers any other species, at least, ten to one. The Ragweed comes up along roadsides and ditch banks, in waste places generally, in pasture fields and fallow ground, and is very annoying on stubble ground after wheat is cut. Some farmers mow wheat stubble once or twice each season in order to prevent this plant from ripening seed.

40. *Xanthinum canadense*, Cocklebur.

41. *Rudbeckia hirta*, Cone-flower.

42. *Helianthus giganteus*, Sun-flower. Also other species of this genus.

43. *Coreopsis tripteris*, Tickseed.

44. *Bidens bipinnata*, Spanish Needles.

45. *Helenium autumnale*, Sneezeweed.

46. *Anthemis cotula*, Mayweed, is a common weed in pastures and along roadsides.

47. *Achillea millefolium*, Yarrow.

48. *Erechtites hieracifolia*, Fireweed.

49. *Arctium lappa*, Burdock.

50. *Cnicus lanceolatus*, Thistle.

51. *Cnicus discolor*, Thistle, grows on ditch banks and along fences. While this is the common form in Fulton County, the true *altissimus* grows at Columbus. I have found this last form at Napoleon, growing along the canal.

52. *Cnicus arvensis*, Canada Thistle, is becoming too common in the county. It is supposed that the seed is carried there, oftentimes, in cloverseed. This Thistle makes a rank growth, and spreads rapidly.

53. *Chicorium intybus*, Chicory.

53. *Hieracium gronovii*, Hairy Hawkweed.

54. *Taraxacum officinale*, Dandelion.

55. *Lactuca scariola*, Prickly Lettuce, is a recent introduction, but promises to become a bad weed. It is referred to, by farmers, more often than any other species. It grows commonly in oat fields.

56. *Lactuca canadensis*, Wild Lettuce.

57. *Lobelia inflata* Lobelia.

58. *Asclepias tuberosa*, Pleurisy-root.

59. *Asclepias cornuti*, Milkweed.

60. *Lithospermum arvense*, Corn Gromwell.

61. *Solanun nigrum*, Nightshade.

62. *Datura stramonium*, Jamestown-weed, grows abundantly in barnyards, or where buildings have once stood; and is considered a very undesirable weed.

63. *Verbascum thapsus*, Mullein.

64. *Gerardia quercifolia*, Gerardia, grows commonly in wood-pastures, and along roadsides. Other species of this genus are common in some places.

65. *Verbena urticæfolia*, White Vervain.

66. *Verbena hastata*, Blue Vervain.

67. *Nepeta cataria*, Catnip.

68. *Leonurus cardiaca*, Motherwort.

69. *Plantago rugelii*, Plantain, is one of the most common weeds in the county. It grows in lawns, meadows and pastures.

70. *Plantago lanceolata*, Ribgrass.

71. *Amarantus retroflexus*, Pigweed.

72. *Amarantus albus*, Tumble-weed.

73. *Chenopodium album*, Pigweed.

74. *Phytolacca decandra*. Pokeweed.

75. *Rumex crispus*, Sour Dock.

76. *Rumex obtusifolius*, Bitter Dock.

77. *Rumex acetocella*, Sorrel, grows abundantly on sandy soil. It is very troublesome in meadows and pastures, and is considered a bad weed. Where clover or grass seed fails, Sorrel usually grows abundantly. The two preceding species of Dock grow abundantly in the county also.

78. *Polyganum hydropiper*, Smartweed, grows in low places and is very abundant. Other species of this genus are often annoying, but this one is the most common.

79. *Euphorbia corollata*, Go Quick, is a weed of some note. It grows abundantly on high ground. Appears early and stays until frost kills it.

80. *Urtica gracilis*, Nettle.

81. *Cenchrus tribuloides*, Burgrass. This a vile weed in places. It grows on sandy ground, especially where dirt from excavations is used for leveling lawns. Along highways that have been graveled recently, this weed is entirely too abundant. The facility it possesses for scattering its seeds rapidly, widens the territory overrun by this plant, and aids materially in making it the most dreaded weed pest of the county.

II. List of plants observed in bloom between April fifteenth and June fifteenth, 1894.

Thalictrum dioicum,
Ranunculus multifidus,
Ranunculus abortivus,
Ranunculus multifidus terrestris,
Ranunculus recurvatus,
Ranunculus septentrionalis,
Caltha palustris,
Aquilegia canadensis,
Podophyllum peltatum,
Menispermum canadense,
Nuphar advena,
Sanguinaria canadensis,
Dicentra cucularia,
Dentaria laciniata,
Cardamina rhomboidea,
Arabis perfoliata,
Camelina sativa.
Nasturtium armoratia,
Brassica sinapistrum,
Brassica nigra,
Capsella bursa-pastoris,
Lepidium virginicum,
Viola palmata,
Prunus americana,
Prunus pumila,
Saxafraga pennsylvanica,
Heuchera americana.
Ribes cynosbati,
Ribes floridum,
Aralia nudicaulis,
Cornus florida,
Cornus stolenifera,
Cornus paniculata,
Viburnum acerifolium,
Viburnum prunifolium,
Viburnum lentago,
Triosteum perfoliatum,
Galium aparina,
Erigeron annuus,
Erigeron bellidifolius,
Erigeron philadelphicus,
Antennaria plantaginifolia,
Krigia amplexicaulis,
Taraxicum officinale,
Gaylussacia resinosa,
Vaccinium vacillans,

Viola palmata cuculata,
Viola pubescens,
Viola blanda,
Viola sagittata,
Viola canina muhlenbergii,
Silene antirrhina,
Stellaria media,
Cerastium vulgatum,
Claytonia virginica,
Malva rotundifolia,
Geranium maculatum,
Oxalis acetosella,
Staphylea trifolia,
Lupinus perennis,
Tephrosia virginiana,
Apios tuberosa,
Spireae salicifolia,
Spireae tomentosa,
Physocarpus opulifolius,
Rubus strigosus,
Rubus occidentalis,
Rubus villosus,
Rubus canadensis,
Rubus hispidus,
Rubus triflorus,
Geum vernum,
Potentilla canadensis,
Fragaria virginiana,
Pyrus coronaria,
Pyrus arbutifolia,
Pyrus arbutifolia melanocarpa,
Cratægus crus-galli,
Gaultheria procumbens,
Chimaphila umbellata,
Phlox maculata,
Phlox divaricata,
Hydrophyllum virginicum,
Cynoglossum officinale,
Echinospermum virginicum,
Lithospermum arvense,
Lithospermum canescens,
Solanum dulcamara,
Datura stramonium,
Veronica peregrina,
Castilleia coccinea,
Pedicularis canadensis,
Nepeta glechoma,
Comandra umbellata,
Myrica asplenifolia,
Habenaria bracteata,
Habenaria virescens,
Cypripedium pubescens,
Iris versicolor,
Hypoxis erecta,
Smilax herbacea,
Polygonatum biflorum,
Smilacina racemosa,
Lilium philadelphicum,
Trilium erectum,
Trilium grandiflorum,
Arisæma triphillum,
Symplocarpus fœtidus,
Acorus calamus.

III. A list of the species of the Orchis Family observed in the county.

Aplectrum hyemale,
Spiranthes cernua,
Pogonia pendula,
Habinaria virescens,
Habinaria bracteata,
Habinaria ciliaris,
Cypropedium pubescens,
Cypropedium spectabile.

IV. Some species that are reported as rare in northern Ohio.

Lespedeza intermedia, (Watson) Britt,
Prunus pumila, L.,
Solidago riddellii, Frank,
Helianthus occidentalis, Riddell,
Buchnera americana, L.,
Dasystoma pedicularia, (L) Benth.

NOTES ON VARIETIES OF THE APPLE.

BY PROFESSOR WILLIAM R. LAZENBY.

Although the apple is the best known fruit of temperate zones and many of its different varieties are readily recognized, there is still a great lack of definite knowledge regarding the requisites or essentials that go to make a perfect specimen of this orchard product. What is the apple structurally ? It is not simply the matured ovary or pistil of the flower, like a peach or plum. It is not the enlarged fleshy receptacle, or end of the flower stem like the strawberry. It has a structure peculiar to itself.

If we examine the flavor of any of our strictly pernaceous fruits, we shall find that the pistil or ovary is made up of five distinct leaves or carpels, which unite and form five distinct cells.

Continuing our observations we shall find that the calyx of the flower is closely and firmly adherent to this ovary. After the flower is fertilized and the young apple begins its development, we find that it is the calyx that grows the most rapidly and forms the larger part of what becomes edible. The receptode also forms a part of the flesh, while the true ovary is simply the *core*, or the papery carpels with the included seeds.

In describing different varieties of the apple, the external characters including firmness and weight, first claims our attention. Here comes the internal characteristics. The principal external characters are *shape*, *size* and *color*. In addition to these however, there are the basin and cavity, including the stem and eye ; the skin and dots therein.

The principal internal characters are the *core*, *seeds*, and texture of the flesh.

The qualities or characteristics that seem to be in demand in apples at the present time are : (1) bright color ; (2) moderate and uniform size ; (3) uniform shape ; (4) richness ; (5) spicy flavor ; (6) small core with few seed ; (7) smooth thin skin, but sufficiently tough to prevent easy bursting ; (8) good keeping qualities ; (9) good cooking qualities. In addition the tree should be healthy, vigorous, hardy, long-lived and productive. Although there are almost infinite number of varieties of the apple, the ideal or perfect apple has not yet been produced. There are however, occasional specimens that fall little short of perfection.

How many really good varieties of apples are there in the United States? In 1892 there were 833 different, named varieties of apples offered for sale by nurserymen. This however is only a small part of the total number of varieties in existence.

Ever since the organization of the American Pomological Society in 1850, it has been the duty of a standing Committee of that Society to examine the lists of fruit now under cultivation and report the names of such as they deemed worthy, and also of such as should be farther recommended.

In 1852 the first Journal Report was presented and thirty-two varieties of apples were listed.

The list was divided into three groups: (1) *Those worthy of general cultivation*; (2) those adapted for particular localities; (3) for varieties which promise well. The following are the varieties of the first group—Summer Pearmain, Baldwin, Bullock's Pippin, Danvers Winter Sweet, Early Harvest, Early Strawberry, Fall Pippin, Fameuse or Snow, Gravenstein, Hubbudston's Nonesuch, Sweet Bough, Lady Apple, Porter, Red-Astrachan, R. F. Greening. Roxbury, Russet, Summer Rose, Swaar, Vandevere, Seek-no-further, Wine Apple and Winesap.

For particular localities the following *five* varieties were named: Canada Red, Eropus Spitzenburg, Newtown Pippin, Northern Spy and Yellow Belleflower.

The third group or those which promised well, were: Autumn Bough, Harley, Melon, Mother, Northern Spy, Smokehouse, (six in all). As an evidence of the care with which this list was made up, it should be stated that after the lapse of forty years, all but two of these varieties are still listed as among the best, and all but one are propagated by the nurserymen of to-day.

The list of 1891—the last that I have been able to consult, contains 339 named apples, as being worthy of cultivation. Of this number it is a matter of interest to know that only twenty-two are of foreign origin. That is out of 339 of our very best apples, all but twenty-two originated in this country.

The first apple-tree nursery in Ohio was begun by A. W. Putnam in 1794, a few years after the first white settlement at Marietta. In the spring of 1796, just one hundred years ago last spring, this seedling nursery stock was grafted with cions brought from the orchard of Israel Putnam, of Ponfret, Conn. Twenty-two varieties were propagated, among them the following which are still largely grown and highly esteemed: Summer Queen, Roxbury Russet, Rhode Island Greening, Tolman Sweeting, Cooper, Black Gilliflower, Esopus Spitzenburg, Westfield and Seek-no-further.

List of Apples for Central and Southern Ohio.

Summer, (*6*).

Early Strawberry,
Early Harvest,
Red Astrachan,
Summer Peermain,
Summer Queen,
Tetofski.

Autumn, (*12*).

Cooper,
Duchesse,
Fall Pippin,
Gravenstein,
Jersey Sweet,
Lorrell,
Maiden's Blush,
Nonpareil,
Porter,
Rambo,
Smokehouse,
Wealthy.

Winter, (20).

Baldwin,
Ben Davis,
Fallawater,
Grimes Golden,
Golden Russet,
Jonathan,
Northern Spy,
Peck's Pleasant,
Rawle's Janet,
Rome Beauty,
Roxbury Russet,
Smith's Cider,
Stark,
Tolman Sweet,
Western Beauty,
White Pippin,
Willow, Limbertwig,
Winesap,
Belleflower,
York Imperial,

VEGETABLE PATHOLOGY.

A REFERENCE INDEX of all the Patholgic Conditions of Vegetable Tissues mentioned in the REPORTS and BULLETINS of the New Jersey Agricultural Experiment Station, from the pen of DR. D. B. HALSTED.

COMPILED BY F. L. STEVENS.

This index includes all mentions of pathologic conditions due to fungi, bacteria or nematodes made in the Annual Reports and Bulletins of the New Jersey Agricultural Experiment Station since Dr. Halsted has been botanist there; that is from 1889 up to, and including, the last annual report issued, that of 1895, and Bulltins including No. 112 and Bulletin R.

It is of course especially rich in green house and garden plant fungi and it is hoped that it may be useful to the horticulturist or pathologist in giving them complete command of the extensive literature from this one experiment station, so that with a glance they can determine whether diseases upon any given plant have been noted, what the diseases were and where they were mentioned.

The hosts are considered in alphabetical order, using the name by which the plant is most commonly known by those who cultivate it. Thus we have Apple, Asparagus, Celery, Beet, etc.; also Abutilon, Alocasia, Caryota, Aspedistra, etc.

Following this will be the name of the cause of the disease and its reference, thus: Rept. 1891, 281, which signifies Annual Report for 1891, page 291; or Bull. 78, which refers to Bulletin No. 78.

In all there are included here one hundred and fifty-five hosts, and thirty-one fungi are mentioned which were described by Dr. Halsted either alone or together with J. B. Ellis.

Abutilon. *Colletotrichum*, Rept. 1891, 291.

Ageratum. *Phyllosticta*, Rept. 1891, 295.

Alternanthera. *Phyllosticta*, Rept. 1892, 292.

Alocasia. *Gloeosporium, and sac fungus*, Rept. 1891, 295.

Anthurium. ———, Rept. 1892, 301.

Apple. *Bacteria*, Rept. 1893, 372.
Bacillus amylovorus, Burl., Rept. 1894, 321.
Gymnosporangium macropus, Lk., Bull. 86, Rept. 1894, 324.
Sphaeropsis malorum, Berk., Rept. 1894, 324; Rept. 1892, 323, 324
Rept. 1893, 366, 374; Rept. 1895, 330.
Monilia fructigena, Rept. 1892, 323.
Podosphaeria oxycanthae, D. C., Rept. 1892, 337; Bull. 86.
Podosphaeria trydactyla, D. By., Rept. 1891, 244.

Apple. *Roestelia pirata*, Thax., Rept. 1891, 305, 245; Rept. 1892, 323, 329, 337.
Gloeosporium fructigenum, Berk., Rept. 1892, 305, 323, 329, 331, 338; Rept. 1894, 324; Bull. 86; Rept. 1893, 373.
Fusicladium dendriticum, Fl., Bull. 86; Rept. 1894, 324; Rept. 1892, 323, 337; Rept. 1893, 369.
Phyllostica, Rept. 1895, 330.
Penicillum glaucum, Lk., Rept. 1892, 323; Rept. 1893, 371.

Aralia. *Leptosphaeria*, Rept. 1891, 295.
Anthracnose, Rept. 1892, 305.

Aspidistra. *Colletotrichum*, Rept. 1891' 295; Rept. 1892, 297, 305.
Colletotrichum omnivorum, Hals., Rept. 1891, 293.

Asparagus. *Puccinia asparagi*, D. C., Special Bulletin Aug. 18–'96.
Azalea. *Synchytrium vaccinii*, Bull. 64.
Balm. *Puccinia menthae*, P., Rept. 1893, 391.
Banana. *Gloeosporium musarum*, C. & M., Rept. 1892, 326.
Beet. *Oospora scabies*, Thax., Rept. 1894, 337; Bull. 107.
Phyllosticta, Rept. 1894, 338, 345, 346; Bull. 107.
Cercospora beticola, Sacc. Rept. 1894, 340, 345; Bull. 107.
Uromyces betae, Pers., Rept. 1894, 343; Bull. 107.
Cystopus bliti, Biv., Rept. 1894, 345; Bull. 107.
Peronospora schaehtii, Fl., Rept. 1894, 345; Bull. 107.
leaf blight, Rept. 1895, 328, 333, 335, 340, 343, 345.

Bean. *Colletotrichum lagenarium* (Pass.) E. & Hals., Rept. 1894, 294, 335; Rept. 1895, 283, 323; Bull. 108.
Collectotrichum lindemuthianum, Rept. 1891, 284; Rept. 1892, 305, 326, 329, 332, 343; Rept. 1893, 347.
bacteria, Rept. 1894, 335; Rept. 1895, 325; Rept. 1892, 283; Rept. 1892, 326.
Uromyces appendiculatis, P., Rept. 1894, 332, 333, 339, 340, 341, 344; Rept. 1891, 242.
Gloeosporium lindemuthianum, Rept. 1893, 347.
Phyllosticta, Rept. 1894, 336; Rept. 1891, 287; Rept. 1892, 326.

Begonia. *nematodes*, Rept. 1891, 310.
anthracnose, Rept. 1892, 305.

Blackberry. *Caeoma nitens*, Rept. 1891, 243; Rept. 1894, 324.
Gloeosporum venetum, Speg., Rept. 1894, 324.
Puccinia peckiana, Howe, Rept. 1894, 324.

Bletia. *Colletotrichum bletiae*, Hals., Rept. 1893, 417.
Volutella concentrica, Hals., Rept. 1893, 417.

Blossoms. *Monilia fructigena*, Rept. 1894, 389.
Boston Ivy. *Plasmopara viticola*, B. & De T., Rept. 1891, 243.
Bouvardia. *nematodes*, Rept. 1890, 369.
Brussels sprouts. *Club root*, Bull. 98; Rept. 1893, 341.

Cabbage. *Peronospara parasitica*, P., Rept. 1894, 346; Rept. 1895, 321; Rept. 1890, 349; Rept. 1891, 242; Bull. 108.
Plasmodiophora Brassicae, Wor., Rept. 1895, 332; Rept. 1894, 346, 285; Bull. 98; Rept. 1890, 348; Rept. 1893, 332; Rept. 1891, 242.
Macrosporium brassicae, Rept. 1894, 346; Rept. 1890, 349.

Calceolaria. *Micrococcus*, Rept. 1893, 431.

Calla. *Bacteria*, Rept. 1893, 400.
Phyllosticta richardiae, Hals., Rept. 1893, 400.
Cercospora richardiaecola, Atk., Rept. 1893, 401.
Pestalozzia richardiae, Hals., Rept. 1893, 401.

Carnation. *Bacteria*, Rept. 1890, 363; Rept. 1893, 387; Rept. 1894, 392.
Micrococcus, Rept. 1893, 426.
Colletotrichum, Rept. 1891, 301; Rept. 1893, 385; Rept. 1892, 304, 305.
Septoria dianthi, Desm., Rept. 1890, 363; Rept. 1891, 301; Rept. 1893, 384; Rept. 1894, 392.
Uromyces caryophyllinus, Schr., Rept. 1891, 302; Rept. 1893, 384; Rept. 1894, 392.
Heterosporium echinulatum, Berk., Rept. 1893, 386; Rept. 1894, 392.
Vermicularia subeffigurata, Schw., Rept. 1890, 363.

Carrot. *Cereospora apii*, Fr., Rept. 1894, 346; Rept. 1895, 329, 333, 334, 335.
Bacteria, Rept. 1890, 352.

Caryota. *Anthracnose*, Rept. 1893, 410.

Cauliflower. *Club root*, Bull. 98.

Celery. *Cercospora apii*, Fr., Rept. 1894, 346; Rept. 1891, 242, 250, 259, 289; Rept. 1895. 242, 243, 245, 306, 328, 333; Bull. Q.
Septoria petroselini apii, B. & C., Rept. 1894, 347; Rept. 1891, 255, 259; Bull. Q.
Phyllosticta apii, Hals., Bull. Q; Rept. 1891, 253, 259.
Bacteria, Bull. Q; Rept. 1891, 558.
Nematodes, Rept. 1891, 257.
Puccinia bullata, Wint., Bull. Q; Rept. 1891, 256, 259.
Puccinia castagnei, Thm., Bull. Q; Rept. 1891, 257.

Centaurea. *Septoria*, Rept. 1891, 295.

Cherry. *Cylindrosporium padi*, Karst, Rept. 1894, 325; Rept. 1891, 304.
Monilia fructigena, Pers., Rept. 1894, 325; Rept. 1891, 288; Rept. 1895, 330.
Plowrightia morbosa, Schw., Rept. 1894, 326; Rept. 1890, 364; Rept. 1891, 244; Bull. 78.
Exoascus cerasi, Fl., Rept. 1895, 355.
Septoria cerasina, Pk., Rept. 1892, 340; Bull. 86.
Podosphaeria trydactyla, D. By., Rept. 1891, 244.

Chrysanthemum. *Phyllosticta*, Rept. 1891, 292.
Nematode, Rept. 1890, 368.
Septoria minima, Hals., Rept. 1894, 365.
Septoria, Rept. 1891, 292.
Septoria chrysanthemi, E. & D., Rept. 1894, 363; Rept. 1891, 298.
Oidium chrysanthemi, Rabenh., Rept. 1894, 362.
Erysiphe cichoracearum, D. C., Rept. 1894, 363.
Cylindrosporium chrysanthemi, E. & D. Rept., 1894, 365.
Phyllosticta chrysanthemi, E. & D. Rept. 1891, 298; Rept. 1894, 368.
Cinnamon. *Anthracnose*, Rept. 1892, 305.
Cissus. *Anthracnose*, Rept. 1892, 305.
Citrus. *Anthracnose*, Rept. 1892, 305.
Citron. *Collectotrichum lagenarum*, (Pass.) E. & Hals., Rept. 1892, 326, 329.
Clematis. *Colleclotrichum*, Rept. 1891, 291.
Clover. *Uromyces trifolia*, Lev., Rept. 1891, 309.
Coleus. *Nematodes*, Rept. 1890, 368.
Phyllosticta, Rept. 1891, 295.
Corn. *Bacillus zeae*, Rept. 1893, 426.
Cosmos. *Phlyctaena*, Rept. 1894, 371.
Cranberry. *Synchytrium Vaccini*, Thos.. Bull. 64; Rept. 1889, 233; Rept. 1890, 332; Rept. 1894, 326; Rept. 1891, 243.
Scald, Bull. 64; Rept. 1889, 234; Rept. 1890, 334.
Crocus. *Uromyces croci*, Pass., Rept. 1893, 393.
Croton. *Gloeosporium*, Rept. 1892, 304, 305; Rept. 1891, 295.
Phyllosticta, Rept. 1891, 295.
Cucumber. *Colletotrichum lagenarium*, Rept. 1894, 347; Rept. 1895, 303, 327, 340, 345.
Gloeosporium lagenarium, Rept. 1893, 347.
Plasmopara cubensis, B.&C. Rept. 1894, 348; Rept. 1889, 235; Rept. 1892, 277; Rept. 1895, 303, 327, 342, 345; Rept. 1891, 248.
Bacteria, Rept. 1894, 348.
Currant. *Nectria cinnabarnia*, Tode., Rept. 1894, 327.
Hamestegia, Rept. 1894, 327.
Septoria ribis, Desm., Rept. 1891, 304; Rept. 1894, 326.
Cercospora angulata, Wint., Rept. 1891, 304.
Gloeosporium ribis, D. & M., Rept. 1891, 243; Rept. 1894, 326.
Cyanophyllum. *Anthracnose*, Rept. 1892, 305.
Cyclamen. *Phyllosticta*, Rept. 1891, 295.
Phoma cyclamenae, Hals., Rept. 1893, 397.
Septoria cyclamenae, Hals., Rept. 1893, 397.
Botrytis vulgaris, Rept. 1893, 398.
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Dahlia. *Phoma dahliae*, Berk., Rept. 1894, 372.

Dracaena. *Gloeosporium*, Rept. 1892, 305; Rept. 1893, 414; Rept. 1891, 295.
Colletotrichum, Rept. 1891, 295.
Phyllosticta, Rept. 1891, 295.
Phyllosticta maculicola, Hals., Rept. 1893, 412.
Vermicularia concentrica, Lev., Rept. 1893, 412.

Dieffenbachia. *Gloeosporium*, Rept. 1891, 295.
Collectotrichum, Rept. 1891, 295.

Egg plant. *Phyllosticta hortorum*, Speg., Rept. 1895, 300, 326, 340, 342, 344; Rept. 1892, 326; Rept. 1890, 355; Rept. 1891, 279; Rept. 1894, 348.
Pythium de baryanum, Rept. 1892, 287.
Gloeosporium melangenae, E. & Hals., Rept. 1892, 326, 329, 330; Rept. 1890, 358; Rept. 1891, 281.
Sclerotia, Rept. 1893, 363.
Botrytis fasciculatus, Cord., Rept. 1890, 357; Rept. 1894, 348.
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Phoma solani, Hals., Rept. 1891, 277.
Nectria ipomoeae, Hals., Rept. 1891, 281; Rept. 1894, 348.

Elderberry. *Aecidium sambuci*, Schw., Rept. 1895, 356.

Euonymus. *Coryneum*, Rept. 1891, 295.

Ficus. *Gloeosporium*, Rept. 1891, 295; Rept. 1892, 305.
Nematodes, Rept. 1892, 381.
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Fern. *Nematodes*, Rept. 1891, 313.
Pythium de baryianum, Hesse, Rept. 1891, 313.
Phyllosticta pteridis, Hals., Rept. 1893, 421.

Filberts. *Cryptosporella anomala*, (Pk.) Sacc., Rept. 1892, 288.

Fraxinus. *Coniothyrium*, Rept. 1891, 295.

Funkia. *Colletotrichum*, Rept. 1891, 294, 295; Rept. 1892, 305.
Phyllosticta Funkiae, Hals., Rept. 1892, 293; Rept. 1892, 295.
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Gladiolus. *Urocystis gladioli*, (R.) Sm. Rept. 1893, 393.
Puccinia gladioli, Cast. Rept. 1893, 393.
Sphaerella fusca, Pass. Rept. 1893, 393.

Gooseberry. *Gloeosporium Ribis*, Lib. Rept. 1895, 331.
Sphaerotheca mors-uvae, (Schw.) B. & C. Rept. 1892, 329, Rept. 1894, 327, Rept. 1891, 243.
Septoria Ribis., Desm, Rept. 1894, 327.

Grape. *Plasmopara viticola*, B. & DeT. Rept. 1891, 243, 247, Rept. 1894, 328, Rept. 1892, 276, 325, 329, 340, Bull. 86.
Oidium tuckeri, Berk. Rept. 1894, 383.
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Grape. *Sphaceloma ampilinum*, D. By. 328.
Mealnconium fuligineum, S. & V. Rept. 1894, 328.
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Hedera. *Colletotrichum*, Rept. 1891, 295.
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Hibiscus. *Phyllosticta*, Rept. 1891, 295.

Hollyhock. *Puccinia malvacearum*, Rept. 1890, 361, Rept. 1891, 297, Rept. 1893, 320, 381.
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Phyllosticta althaeina, Rept. 1891, 297, Rept. 1893, 382.
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Septoria frirmani, E. & E. Rept. 1891, 294.

Horseradish. *Septoria armoraciae*, Sacc Rept. 1890, 360, Rept. 1894, 349.
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Cystopus candidus, Rept. 1890, 249.

Hoya. *Anthracnose*, Rept. 1892, 305.

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Impatiens. *Phyllosticta*, Rept. 1891, 295.

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Jassamine. *Colletotrichum*, Rept. 1891, 291.

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- *Puccinia pruni-spinosa*, Pers. Rept. 1891, 244.
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- *Cercospora persica*, Sacc. Rept. 1894, 330.
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T. F. Hunt.

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Columbus Horticultural Society.
1897.

ANNUAL REPORT

OF THE

COLUMBUS HORTICULTURAL SOCIETY

For the year ending December 31, 1897,

CONTAINING

CONSTITUTION, LIST OF MEMBERS AND
QUARTERLY JOURNAL.

PREPARED BY
J. S. HINE, SECRETARY.
O. S. U.

COLUMBUS, OHIO, 1898.
PUBLISHED BY THE SOCIETY,

COLUMBUS HORTICULTURAL SOCIETY.

1897.

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CONSTITUTION.*

NAME AND OBJECT.

SECTION 1. This Society shall be known as the COLUMBUS HORTICULTURAL SOCIETY.

SEC. 2. The object for which it is organized is the advancement of horticultural knowledge.

MEMBERSHIP.

SEC. 3. Any person may become a member of the Society by the payment of one dollar. Wives and daughters of members shall be members without the payment of any fee. Male members shall pay an annual fee of fifty cents, in advance, which shall be for the year ending with the next succeeding annual meeting; and no member shall have the right to vote, or other privilege of membership of the Society, so long as such annual fee shall remain unpaid. Any lady resident in Franklin County may become a member without any fee.

SEC. 4. Any person may become a life member of the Society upon payment of ten (10) dollars, which shall be in lieu of all assessments or annual dues; and all persons who have been members for twenty or more years, and have paid their regular dues, shall be life members.

SEC. 5. Any person distinguished in horticulture, upon the recommendation of the Executive Committee, may be elected an honorary member of the Society by the affirmative vote of two-thirds of the members present at any regular meeting. Honorary members shall not have the right to vote nor incur any of the liabilities of members, but they shall be admitted to all meetings and exhibitions of the society.

OFFICERS.

SEC. 6. The officers of the Society shall be a President, a First Vice-President, as many Vice-Presidents as there may be local sections of the Society, a Secretary, a Treasurer, and an Executive Committee of three members, all of whom, except the Vice-Presidents *ex-officio*, shall be elected by ballot at the regular meeting in December, and shall serve until their successors are elected. The President of each section shall be *ex-officio* Vice-President of this Society.

SEC. 7. The President, or, in his absence, the Vice-President, shall preside at all meetings of the Society and of the Executive Committee. In the absence of both, a President *pro tem.* shall be appointed.

SEC. 8. The Secretary shall keep a record of the proceedings of the Society, and attend to all necessary correspondence. He shall also receive all moneys due the Society for membership, annual fees and assessments, and pay over the same to the Treasurer; and shall receive as a remuneration for his services the sum of fifty (50) dollars per year.

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*As Amended January 24th, 1894.

SEC. 9. The Treasurer shall receive from the Secretary all money and funds belonging to the Society, and shall be the custodian of all bonds, stocks and securities belonging to the Society, and shall pay out and transfer the same only on the order of the Society, certified by the President and Secretary; and he shall keep an account of the receipts and disbursements, and report it to the annual meeting; and shall give such bonds as the Executive Committee may require.

SEC. 10. The Executive Committee shall have control of all exhibitions, and have a general supervision of all matters pertaining to the welfare of the Society. It shall have power to call special meetings whenever, in its judgment, it shall be necessary.

SEC. 11. The chairmen of the standing committees shall be elected at the annual meeting, and such chairmen shall have the power to appoint the other members of their respective committees.

SEC. 12. The following standing committees shall be elected:

1. On Botany.
2. On Vegetable Pathology.
3. On Entomology.
4. On Meteorology.
5. On Library.
6. On Fruits.
7. On Plants and Flowers.
8. On Vegetables.

INVESTMENTS.

SEC. 13. The Executive Committee shall make and manage all investments. No investment shall ever be changed without the recommendation of said committee, approved by two-thirds each of the members and life members of the Society; nor shall the present invested fund of the Society ever be reduced in amount; but if it should become so by any unavoidable cause, the income shall be invested until the full amount is restored.

SEC. 14. The funds of the Society shall be invested either in the bonds of the United States, the State of Ohio, the City of Columbus, or Franklin County, Ohio; or in loans not exceeding the legal rate of interest in the State of Ohio, payable semi-annually or annually, and secured by first mortgage on unincumbered real estate, situated in Franklin County, Ohio, of the value of twice the amount of the sums loaned thereon, exclusive of buildings and improvements.

LOCAL SECTIONS.

SEC. 15. Whenever a local membership of ten or more members of the Society, in good standing, residing at or near any point in Franklin County shall make application to the Society it may grant to said members permission to organize a Section to further the objects of the Society; said Section be authorized to hold meetings, elect officers, recommend persons for membership in the Society, and to originate and recommend such measures as shall be deemed proper, but the meetings of the Section shall occur on some other day than that of the regular meeting of the Society.

SEC. 16. All annual fees of members affiliating with any Section and 50 per cent. of the membership fees of those recommended by the Section shall be reserved by it, the money thus accruing to be expended in such manner, consistent with the object of the organization, as it may direct.

SEC. 17. All members affiliating with any Section and paying annual dues to the same shall be entitled to the JOURNAL of the Society.

SEC. 18. Each Section shall choose its own officers, of such number as it may determine, including a President, who shall become one of the Vice-Presidents of the Society, and a Secretary-Treasurer, who shall communicate to the Secretary of the Society on or before the annual meeting of each year a report of the condition of the Section for that year, and directly following the meeting in March, June, September and December a quarterly abstract of the proceedings for publication in the JOURNAL, the form and extent of such reports to be under the direction of the Secretary of the Society.

AMENDMENTS.

SEC. 19. This Constitution may be amended at any regular meeting of the Society: Provided, such proposed amendment shall have been submitted, in writing, at least, one week before such meeting.

BY-LAWS.

ORDER OF BUSINESS.

SECTION 1. The following shall be the order of business at every meeting, unless changed at the time by the vote of the meeting:

1. Reading the minutes of the preceding meeting.
2. Unfinished business.
3. Election of members.
4. Reports of special committees.
5. Reports of standing committees.
6. Communications and correspondence.
7. Regular paper or address and discussion.
8. Miscellaneous business.
9. Adjournment.

TIME OF MEETING.

SEC. 2. Regular meetings shall be held on the last Saturday of each month, at 2:00 p. m.

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Columbus Horticultural Society.

QUARTERLY JOURNAL OF PROCEEDINGS.

VOL. XII. COLUMBUS, OHIO, MARCH, 1897. No. I.

PROCEEDINGS OF THE SOCIETY.

JANUARY.

The meeting was called to order by the President, Wm R. Lazenby.

George W. Gill and D. C. Burson, of this city, were elected to membership.

Mr. T. A. Scott, of Westerville, presented a species of scale insect on apple twigs, and asked for information regarding it. He thought it might be the San Jose scale. J. S. Hine stated that the species was not the San Jose scale, but a species known by the scientific term, *Mytilaspis pomorum.*

W. R. Beattie, Chairman of the Committee on plants and flowers, said that geraniums are not desirable for cut flowers, but make nice window plants for winter if not allowed to bloom during the summer season. He also presented specimens of *Smilax lanceolata*, and stated it was a desirable plant for decoration in winter when it is almost impossible to transfer palms and other tender plants.

Mr. E. C. Green in reporting upon vegetables, spoke regarding the superiority of Grand Rapids lettuce over other varieties for forcing purposes. He spoke of the lettuce rot and stated that he thought it could be prevented by careful management.

Prof. Lazenby, exhibited some samples of rhubarb, lettuce and radishes from the Horticultural greenhouse. He had observed that lettuce grew more spindling this season than in former years. This is probably owing to the abundance of cloudy weather, since seventy-nine per cent of January has been taken by cloudy days.

The following question from Belmont county, Ohio, was submitted to the society. What kind of trees would you advise planting; (a) for timber, (b) for nuts? Prof. Lazenby recommended the white ash, catalpa and the black locust for timber trees, with the restriction, "if the borer can be prevented from destroying the latter."

Mr. G. W. Gill, spoke of the Japanese chestnut and said that he had heard that it will fruit in three years from the seed. Also that he had the statement from the U. S. Department of Agriculture, that this species will thrive wherever the American chestnut will grow.

D. C. Burson, mentioned *Catalpa specioso* as a promising timber tree, and stated that ten year's growth would produce a specimen of this species ten inches in diameter. J. S. Hine referred to a specimen of the pecan tree growing in Fulton county. The tree is about eighteen years old, thirty feet high and produced a half bushel of dry nuts the past season.

H. M. Sessions read a paper on "Shade Trees and their Treatment," and J. H. Lageman discussed the subject of "Hedges."

T. A. Scott recommended that the society meet hereafter at 2 o'clock P. M. instead of 2:30 as heretofore.

The society then adjourned.

FEBRUARY.

A profitable meeting was held in the Horticultural Building, Ohio State University, February 27. Vice President Sessions presided.

Jas. S. Hine reported that several volumes of periodicals from the society's library had been taken to the bindery. Among these are several volumes of Mehan's Monthly, Garden and Forest, Journal of the Cincinnati Society of Natural History, Canadian Plants and Bulletin of the Scientific Laboratories of Denison University.

J. H. Lageman in reporting on Botany spoke of the larch tree, *Pinus larix.* He said that this tree, as seen in this city, is unsightly in appearance, as it retains its cones that were produced several seasons ago, with those of the present year's growth. Mr. Lageman said that the birds that compelled these cones to fall in former years had now become too scarce to preform the work. He recommended that this society appoint a committee on Ornithology to look after the interest of birds in this locality

Prof. D. S. Kellicott spoke regarding specimens of rose scale, *Diaspis rosae*, and the wooly aphis, *Schizoneura lanigera*, both of which species he received from Chillicothe. The former is common on roses and raspberries in this locality. The latter is often met with and works both above and below the surface of the ground. Kerosene emulsion will destroy it above ground and bisulphide of carbon will control the root form.

W. R. Beattie reported abundance of scale insects and mealy bugs, and stated that the winter had been unfavorable for greenhouse work. Jas. S. Hine reported a case of injury to smilax by the white marked cutworm, *Peridroma saucia*. They were controlled by the use of bran and paris green mixed together and moistened. The mixture contained two ounces of Paris green to five pounds of bran and was placed in small piles over the bed of smilax.

Mr. E. C. Green referred to two new varieties of tomatoes, which were produced from crosses he had made. Livingston has named them Golden Ball and Lemon Yellow.

The regular program was as follows :

" A System of Naming and Classifying Plant Diseases," by Prof. W. A. Kellerman.

" Ideal Strawberry Culture," by Mr. M. Crawford.

The society adjourned.

MARCH.

Meeting called to order by the President, William R. Lazenby.

Dr. Edward Orton was elected to life membership in the society by the unanimous vote of those present.

T. A. Scott, of Westerville, also became a life member by paying the $10.00 required by the constitution.

Prof. Kellicott, in his report on entomology, mentioned the harlequin cabbage bug, *Murgantia histrionica*, and said further that since it had appeared in this locality last fall it would in all probability cause some annoyance to cabbage growers the coming summer. He stated that this is the year for the appearance of the seventeen-year cicada in Knox county.

The insect is not likely to reach this county. He referred to the bagworm, *Thyridopteryx ephemeraeformis*, as an insect liable to bebome a serious pest in this section.

Several of the fruit growers present stated that the weather of March had been unfavorable to fruit buds and that much injury to cherries and peaches had resulted.

R. J. Tussing reported excellent success with lettuce the past winter. U. G. Swingle said his lettuce did not grow well during the fore part of the winter, but prospects were good at present.

R. J. Tussing said he had understood that rhubarb roots should remain outside and be allowed to freeze before removing to the green house for winter forcing.

U. G. Swingle said that by active observation he had concluded that rhubarb roots should freeze before being taken into the green house for the purpose of forcing.

Prof. Lazenby read a note from Prof. McFadden, of Westerville, stating that the weed reported as a specimen of Russian thistle, proves to be the common tumble weed.

The regular program was as follows ;

"Planting Trees for Timber," D. C. Burson.

"Our Most Important Forest Insects,', Prof. D. S. Kellicott.

"Nut Bearing Trees as Ornamental Plants,', Prof. Wm. R. Lazenby.

T. A. Scott invited the society to hold its April meeting in Westerville. The invitation was referred to the Executive Committee.

Adjourned.

JAMES S. HINE, *Secretary,*

WOOD FAMINE AND FLOOD FACTORS AND THE NECESSITY OF TREE CULTURE FOR TIMBER.

BY D. C. BURSON.

Talk of the droughts of ancient Egypt or modern India, of the Pharaoh plague, of the bubonic scourge of Bombay, or the grief and sorrow that fall in the wake of civil war, and their combined distressing elements would be as pigmies compared to the mighty calamity that is gradually but surely coming upon this lovely land of ours through the instrumentality of the woodman's ax.

This may appear to be a rather broad and even frightful assertion to open discussion on the tree question ; but as tree destruction foreruns tree planting, the "calamity howl" may be timely, and neither visionary nor laughable, but a reality that may dawn upon the American people when it is too late.

It is true this *wood famine* that is so rapidly approaching is not a premeditated act of vandalism, scourge or punishment, but merely a selfish habit originating with our Pilgrim Fathers, who landed in a wilderness and were compelled through necessity to cut, log and burn before they could cultivate.

It was not until within the last half century that there was any intrinsic value placed upon a forest tree. Therefore it is not surprising that there was an impetus in timber cutting when there became a demand for lumber at remunerative prices, and as the demand increased railroads penetrated the forests and the wholesale destruction doubled and quadrupled until to-day we hear a half dozen noble forest trees fall to earth at each pulsation of the heart ; yes, 25 acres of native forest disappear every minute ; 15,000 acres are chopped off between the rising and setting of the sun ; 5,000,000 acres of the original forests are denuded every year. Consequently, as there are less than 200,000,000 acres of timber east of the Rocky mountains, the next half century will not leave a single tree standing between the Atlantic ocean and the Mississippi river. In fact, I believe before 1950 the forests will be driven into the Sierra Nevada mountains.

That it may be within the range of our mental vision let us imagine this vast army of lumbermen with all their mills located in Columbus, and the lumber as it comes from the mills stacked up on High street. We would find the daily production making a pile 25 feet high and ten feet wide, reaching from north to south Columbus, a distance of five miles, or if loaded on cars it would require 75000 cars, or 250 trains every day. We also find over one million men employed in the various departments of wood work in the United States, and to pay their wages monthly would take fifty car loads of silver dollars, and 2000 paymasters, each paying out $25,000, to pay this army of woodworkers in one afternoon.

To give some idea of the part that railroads take in the timber consumption, we would say that in the item of ties alone they cut off annually over 300,000 acres, and if the ties of each year's supply were placed end to end, they would span the earth three times.

Ex-Commissioner Loring says: "The forest products in this country are of greater value than our hay, rye, oats, barley, buckwheat, potatoes and tobacco put together, and three times as valuable as the whole mineral production." And yet, not a hand is put forward to continue or perpetuate the supply.

A lumber famine, or the exhaustion of the supply for mechanical purposes is not the worst calamity that is in wait for posterity.

Climatic influences, deluges and droughts caused by indiscriminate clearing of hill-sides and water courses, have depopulated vast portions of the Old World, and yet it took 2000 years for our European ancestors to do what we have done in less than 200 years. Travelers who have visited Greece, Italy and Spain, who have traveled along the Mediterranean from Greece to Gibralter through a country that was once the paradise of the east, covered with luxuriant vegetation, green meadows and beautiful gardens, cooling springs and rippling streams, shady dells and noble forests, say that all that sea-girt coast has undergone a metamorphosis that is almost incomprehensible. The forests have all been cut down, causing thousands and thousands of square miles of vegetation to disappear. Where once were sparkling streams are now sterile ravines; what was once great upland lakes, surrounded by luxuriance and verdure, are but little more than dead seas, bordered by sand hills and sun parched rocks.

Prof. Marsh says: "The abundance of vegetation on this territory maintained in bygone centuries a population scarcely inferior to the whole Christian world, but to-day is entirely withdrawn from human use, and is reduced to a desolation almost as complete as that of the moon. Another era of equal improvidence would reduce our earth to such a condition of impoverished production, of shattered surface and climatic excess, as to threaten the extermination of the human species."

All this havoc is due to causes set in action by man, and yet where the ancient foreigner cleared square rods the American lumberman clears square miles. But the goal of the road that we are continuing to pursue will not be recognized until our summer droughts reach an African sahara. We are already having this folly of wood destruction brought home by an impressive argument in the form of winter floods on our larger streams, caused almost wholly by cutting the forests off from the upper water courses, leaving no longer a network of moss and roots to absorb the moisture and feed it out slowly into the brook and perennial springs; but now, no matter how light the rain, it pours down from naked hillsides in rapid deluges, swelling brooks to rivers, carrying away even vegetable mould; but in summer time these rivers shrink to shallow creeks and sterile valleys, with no sparkling waters gushing from everlasting springs. We see the Ohio often so low in midsummer that a man can ford it, and in midwinter flooding its banks, washing away everything before it; and the mighty Mississippi at this time is breaking its levees, destroying millions of property, the like of which was never known before the forests were chopped from its upper water courses.

Yes; we see the native forests fast disappearing; we see great climatic changes; we see the rains that should feed our springs descend in devastating torrents, not only washing the fields of their own shore, but shoal the valley rivers with a deluvium of sand and gravel, thereby making them more apt to overflow their banks. We see with the eye of futurity, no more forests, no more lumber to build houses, barns, cars, furniture, wagons, carriages, ties or posts. We see a million wood-workers begging for bread, we see floods and droughts, we see starvation on the hills and drownings in the valleys, we hear the wailings of posterity, and their bitter accusations for the greed and thoughtlessness of their ancestors. But we still have faith in the American people.

We think the calamity which awaits us can be averted, but it can only be done through prompt action of our general or state government. Petitions and memorials have flooded congress in years gone by, praying that some action be taken looking to the preservation of government timber lands, but no action was taken except the withdrawal from public sale of about 18,000,000 acres by President Harrison and 21,000,000 acres by President Cleveland. Of course, this is a wise act, and was no doubt judiciously done, as it was under the direction, not of politicians, but a committee appointed by the National Academy of Science, with Professor Sargent, of Harvard, as president. But these lands being so far removed from commercial marts can only be used as a reserve in the dim future, after the available timber east of the Rocky mountains has all been consumed.

Our congress would show an increase of wisdom if it would divert a few of the millions that are yearly appropriated for building navy iron-clads to the purchase of mountain slopes and check the wholesale clearing on the hills. It is from the mountain sides where trees and vegetation has been removed that the rainfall pours down in turbid streams, increasing the force of the floods with an avalanche of debris. Hence the fact remains that nearly all our floods or inundations have their origin in mountain countries that have been denuded of forests. Let our government get control of the White mountains that feed the Connecticut river, and the Adirondacs that feed the Hudson; also the mountain slopes of the Delaware, Susquehanna, Potomac, Allegheny, Monongehela, Kanawha, Kentucky, Tennessee, Cumberland and many other feeders of our great rivers. We see within the last few years a number of our eastern states have awakened to the absolute necessity of legislative action to stop the wholesale destruction and total nudation of their timer lands.

But what is Ohio doing? As far back as 1878 Governor Bishop, in his message to the General Assembly of Ohio, in speaking of the preservation of the forests, said: "I deem it important to call your attention to the necessity of providing by law for the protection of forests and timber. The statistics of 1877 show that in 1870 there were 9,799,333 acres of timber land in the state; that in 1877 there were 5,117,310 acres of timber land in the state. If these statistics were correct there was within seven years a destruction of over four and a half million acres of forest. The day is not far distant when, if the present annual rate of destruction is continued, the beautiful and valuable forests of our state will soon disappear.

"In many countries in Europe the advantage of forests has been learned in the school of necessity, and now the study of forestry is taught with as much thoroughness and care as the study of other sciences, while the cutting and replanting of trees is regulated and enforced by systematic and careful legislation. In Ohio the question each year is becoming more important, and it is now time, in my judgment, when statistics about the preservation of forests should be annually collected, showing the area and condition of our forests."

Twenty years have passed since this timely advice was given and no legislative action as yet. Other states, especially in the east, have made some move, if it was only the appointing of committees to investigate the condition of the forests.

Massachusetts has adopted the reward of merit plan to encourage forest planting. But their premiums are too small to make it a success on a large scale.

There is no use for a committee of investigation in this state. The most casual observer recognizes the fact that our timber is all gone. But new forests can be grown and grown rapidly. But who is to do it, and how is it to be done? The common farmer who has not given tree raising a second thought can see no money in it for him. Consequently, instead of planting trees, he continues to cut off what is left. The only alternative in a state like Ohio, where the native timber is so near extinct, is to plant new forests, and this can be accomplished by the national or state government buying the land, setting them to timber or encourage the owners of the lands to do it themselves. The latter, in the judgment of the writer, is the more expedient. But that can only be done on a large scale by the legislature making a liberal appropriation for the purpose of offering rewards or premiums for the largest and best groves. I do not believe there is a tax payer in the state when he once realizes the necessity of tree planting that would object to pay at least the one thousanth part of one per cent. or one cent on every thousand dollars of his taxable property. This amount, if paid into the treasury for ten years, would constitute a fund sufficiently large, if properly distributed over the state, either by counties or congressional districts, and offered in a judicious way as premiums for tree planting, would be instrumental in the planting of millions of acres, and our noble state would be saved, and prosperity would thank and praise the liberality and thoughtfulness of their ancestors instead of having to endure the calamity that is sure to follow in the wake of a timber famine.

We favor the offering of premiums merely as an incentive to get people interested in the tree business, but not as a remuneration for doing the work, for there is no legitimate business that will pay larger percentage on capital than the growing of forest trees. And if the men who have money to invest would only investigate fully this tree-growing business, there would be no necessity to offer premiums as an inducement. Where experimental judgment if brought to bear in selecting the ground and varieties to plant, as well as after cultivation, it becomes a very easy matter to calculate the profits in advance. For instance let us take one acre of land say worth $25, and plant it either in Catalpa Speciosa, white ash, European Larch of Black Locust. Experience has taught us that to plant that acre thick, cultivate and thin it, would cost about $50. There might be left standing in that acre 1000 trees until they were twenty years old; but will say there is only 500 left. Any of the above trees will make a growth of almost an inch in diameter in a year, but we will say they will average fifteen inches in the twenty years and would cut at least 150 feet of good lumber, which would be worth at least one cent a foot, or $1.50 for each tree, but we can afford to be conservative in making this estimate and we will cut that amount into, say 75 cents a tree. We will then realize $375 from that one acre that only cost $75 all told. A school boy might be able to tell what per cent. of interest $75 would have to draw to amount to $375 in twenty years. And yet we have calculated this far below what experience has proven that it will do; and as our statement has shown that timber is getting scarcer each year, it would be reasonable to suppose that by the time new lumber can be grown it would be more vaulable, consequently much higher in price, making a still greater interest on the capital invested. Notwithstanding this grand showing in tree culture, there will be comparatively little done until there is some legislative enactment.

IDEAL STRAWBERRY CULTURE.

BY M. CRAWFORD, CUYAHOGA FALLS, O.

Few horticultural products attract more attention than strawberries, when well grown. Even when the market is full of berries, so that every one is accustomed to seeing them, people delight to look at those that are of extraordinary size and beauty. The strawberry responds so readily to good culture, that there is some encourgement in trying to do our best. Another reason for doing one's best lies in the fact that very few will ever put forth any great effort in any direction, so we are relieved, to a great extent, from competition.

One may grow strawberries to perfection by the following ing method, if he be intelligent and persevering, and I may as well say at the beginning that all that is necessary is well-grown plants of a good variety, a rich soil and an abundance of water and sunshine. Any soil may be made deep, rich and moist, and it must be so for best results. Assuming that it is in this condition, and that plants of a good variety have been obtained, the roots should be shortened two inches and the plants set sixteen inches apart. This must be done early in the spring for the best results, and every detail of the work must be done in the best manner. After the plants are set, they should receive the best of cultivation, so as to get them into vigorous growth early.

The blossoms must be cut off as soon as possible, in order to make them send out runners quickly. The first runners will be slender and must be cut off. The next will be stronger, but they too, should be cut off. About the first of July each plant will be sending out a number of very strong runners, and two of the best from each one should be allowed to grow, and make but one plant each. Now, assuming that the ground has been kept mellow and clean, one of these runners is placed on each side of the row, eight inches from the parent plant. It should be held in position by a stone or some soil. In three weeks these runners are well-rooted and may be severed from the old plant. The old plants are then dug up and carried off, leaving two rows of young thrifty plants, sixteen inches apart, and then a space of thirty-two inches for a path. These plants should grow without any check until the end of the season. After taking up the old plants, the space they occupied is to be spaded as deep as possible, finely pulverized, and then well tramped. Of course, the roots of the young plants are not to be disturbed, and for this reason only a narrow strip can be spaded. If the soil is not hard, it need not be spaded at all.

Now, if the whole surface could be covered with two inches of cut straw, the bed will require no attention throughout the season but to cut runners, and occasionally pull up a weed that comes through the mulch. During August and September, great numbers of very strong runners will come out, and they should be cut off as soon as they appear.

At the end of the growing season, the bed should be well covered with straw. There's no danger of putting on too much, if it be removed as soon as growth starts in the spring. It need not be carried off from the bed, but simply be removed from over the crowns.

This management, if faithfully attended to, will insure very fine berries, but if one wants to do his best, regardless of expense, he can still do more. Each of the plants will have a number of crowns, and if all but the best one be cut off early in the spring, it will be like giving the milk of two cows to one calf.

As soon as the first half-dozen berries are formed on each fruit-stalk, a limited number of well-shaped berries are saved, and all others cut off, as well as all the blossoms. Every runner is to be cut off promptly, before it taxes the plant to any extent.

Now, these selected berries have about four weeks in which to get their growth, but this growing period may be extended by shading the plants in the heat of the day. This must be done with caution, lest it be over-done.

No matter how much plant food may be in the soil before the fruit sets, more may be added to advantage during the growth. E. C. Davis, of Massachusetts, who has grown berries of good form, and over three inches in diameter, without pruning, waters with liquid manure two or three times a day while the fruit is growing.

There is a world of pleasure in doing one's very best with some horticultural specialty, but few there be that find it.

A SYSTEM OF NAMING PLANT DISEASES.

BY W. A. KELLERMAN.

(*Abstract.*)

A few of the diseases of plants have been recognized for centuries, though their exact nature was not understood. For example, smut was known to the earliest writers on Natural History, and there have been promulgated many speculations as to its cause. In fact there are people today who can read "bound books" and yet pretend not to accept the facts that patient and critical investigation have established.

It would be difficult if not impossible to give a definition of disease that would hold in all cases. The prominent idea involved, however, is an abnormal condition that is injurious or destructive to the individual. When there is but a slight deviation or abnormal state, for example, a simple leaf when the typical leaf is compound, or four or six petals when the type calls for five, or even a greater variation amounting possibly to a monstrosity, we include such cases under the head of teratology. There is in fact no sharp line between the normal and teratological conditions, nor is there a clear dividing line between normal physiological and pathological conditions. The first passes imperceptably into the second. Nature makes no leaps, early naturalists said ; all her gradations are regular. Modern naturalists say nature is uniform, by which is meant that nature's methods are definite, that her laws are invariable, that causes produce specific results, that all natural phenomena are traceable to definite and natural causes.

If diseased conditions are due to natural causes they can be studied as other departments of nature are studied, and the causes producing them determined. Such study has laid the foundation of the branch of science that we call vegetable pathology. But it is yet in its infancy. While offering many practical suggestions to the horticulturist and agriculturist, there is much to be done and many questions to be considered. One of these is the method of naming diseases, here briefly to be considered.

Shall diseases be named according to their *symptoms* or according to their *causes* ? Neither system can be fully carried out at present for lack of knowledge. But investigation is rapidly extending information and a rational system of nomenclature should if possible be formulated at once.

It might be supposed that symptoms are easily recognized and as accurately described; therefore they would serve advantageously in naming the diseases. But symptoms are apt to vary in different cases, though the disease is the same; symptoms too are often similar or in part identical in case of two or more different diseases. It is certainly true that while many diseases might be named according to their symptoms, numerous others could not be so named. Confusion in many cases would inevitably arise.

On the other hand naming a disease according to its *cause* could not be misleading. It could not be named, it is true, unless its cause was understood, yet it is doubtful whether the disease could be said to be really known if its aetiology (cause) was unknown. A system of naming based on *causes* could be extended as rapidly as our information developed. Besides, the name would be indicative—at least to considerable extent—of the character of the disease. I know in fact nothing that militates against this plan of nomenclature.

I desire now to apply such a system to those diseases of plants that are caused by vegetable parasites, or rather to tell you what has already been done in this line. Briefly stated the plan is this: to add the termination *osus* (anglicised to *ose*) to the universal (scientific) name of the parasite that causes the diseased condition. Thus the name of the smut-parasite is *Ustilago*; therefore the disease caused by this fungus would be an *ustilagosus*, (anglicised to *ustilagose*).

Some additional examples may profitably be given. Thus the generic name of one of the fungi that causes rust on wheat, oats, etc., is *Puccinia* ; hence the name of the disease would be *pucciniose*. The so-called (but inappropriately designated) white-rust of the Shepherd's-purse and other crucifers, is *Albugo* ; hence the diseased condition would be termed *albugose*. One of the diseases (sometimes called rust) of the sorghum caused by the fungus whose generic name is *Helminthosporium*, would be *helminthosporiose*. Another disease of the sorghum, also incorrectly called a rust, is caused by a species of *Bacillus*; hence the disease in this case would be designated as a *bacillose*.

It will be noticed that the four preceding are different diseases, yet all are designated in common parlance by the same name—rust. To indicate these diseases according to a scientific method would, as seen above, obviate the possibility of confusion. If a common or local name is used at all, it certainly should mean but one thing. There is of course no harm in still calling all those diseases caused by the *Uredineæ* (rust-fungi) rusts. A few other common names might be used definitely and retained to advantage. But the aim should be to free our literature from the loose, common, often narrowly local names, and substitute scientific and universal names. This must of course come about gradually. Indeed we have as yet to learn almost eyerything as to diseases—characteristics, as well as names. This is emphatically true of the people at large. Why not learn a universal (scientific) name, correct, not misleading, yet have a real meaning! If investigators and writers would use them—all would be accomplished. There would be no alternative for the mass of people. Do you imagine that this would be a hardship? I think it would be the reverse. We have learned to use the strange name *anthracnose* for a certain disease of the raspberry causes. It is caused by a species of *Glæosporium*. Why not do that which is just as easy—learn once and for all the name *glæosporiose*! I have never heard people, even children, objecting to such scientific names as chrysanthemum, geranium, salvia, rudbeckia, helianthus, hippopotamus. No more will they object to appropriate names of plant diseases.

Very many fungi cause dead spots or dead areas of leaves; to call them leaf-spot fungi, or to call the diseased conditions *leaf-spot*, directs attention, it may be, to the disease, but it certainly gives no information in regard to it. But if we call that caused by any species of Cercospora, a *cercosporose*; that caused by Ramularia, a *ramulariose*; that caused by a Septoria, a *septoriose*; that caused by Sphærella, a *sphærellose*; that caused by Phoma, a *phomose*, etc., our language has a meaning and could not be mistaken.

Again this system has this additional advantage, that a name could be applied to a class of diseases, as well as to each specific disease under that class. Thus the class of fungi causing rusts, is called *Uredineæ*; the general name of the affections caused by these parasites would be *uredinose*. The principal (commonest) genera of this class are Puccinia, Uromyces, and Phragmidium. The diseases caused by species of these genera would be respectively *pucciniose*, *uromycose* and *phragmidiose*. Taking one more example—from the general term Bacteria, the word *bacteriose* would be formed; the true blights would therefore be termed *bacterioses*. But some are caused by species of Bacillus, others by Micrococcus, Spirillum, etc. The names of the specific diseases would therefore be *bacillose*, *micrococcose*, *spirillose*, etc.

A case slightly different may yet be added. Some fungi, for example the common wheat-rust have three distinct stages, called the *Æcidium* stage, the *Uredo* stage, and the teleutosporic stage or *Puccinia*. These are designated by the popular names of Yellow Cluster-cups, Red-rust and Black-rust. The affection connected with these three stages would be, according to the new system, *æcidiose*, *uredose and pucciniose*.

The simplicity of the system, its completeness or thorough adaptability, and the significance of the terminology surely recommend its prompt and universal adoption. Time alone forbids presenting a complete list of the plant diseases now understood with their designation according to this system; but it is not to be regretted because any one can apply it and use the correct nomenclature without further suggestion from me.

HEDGES.

BY J. H. LAGEMAN.

Hedges? What are hedges? Hedges are living bushes, of several varieties, closely planted together and twisted to a good looking appearance to show the border of the property, the extension of mine and thine, as it is now mostly done by the old rotten worm, or new fashioned wire fences.

If we look for some reasons for planting hedges, we find the first one in the scarcity of timber. What an enormous amount of lumber is there contained in one mile of worm, or board, or picket fence. What an enormous number of posts even in wire fences!

Can this be avoided? Certainly it can, as those who once visited the old continent and those few who tried to raise living hedges on our side of the big pond will readily admit.

Hedges, to look a little more into the details of my short essay, are the best division marks between farm and smaller properties. Also for enclosure around woods, orchards, permanent meadows and pasture-grounds. Hedges, properly planted and managed, look nicer along roads and are not so endangering for men and animals as worm or zigzag, board and especially wire fences. From an aesthetical standpoint nothing looks nicer and prettier than property surrounded by well managed hedges.

What kind of hedges?

A hedge surrounding the division line, or between farms should be higher and stronger than hedges for ornamentation. Hedges for division line should not consist of Ossage Orange bushes, except where there is danger from stray cattle, stealing wayfarers etc. If such safty hedges are required, by all means keep them in good shape. Far better are hedges from *Carpinus americanus* or ironwood. These plants are found here everywhere growing wild in woods and they also may be raised very cheap. Hop horn beam, *Ostrya virginica* is also a very good hedge plant.

I would recommend for a new hedge plant our slippery elm. It grows everywhere, is a hardy plant, stands a good deal of rough handling, can be trimmed easily, stands bending and twisting very well and gives a very good hay of foliage when trimmed in summer.

For ornamental hedges, for covering up backyards, cattle-pens, coal-sheds and the like, the *Ligustrum valgare* or privet, is excellent, as no cattle will touch it, and it grows here almost like an evergreen. snowball, snowberry and cornus, of different kinds, are also suitable for covering hedges, better yet are hazelnut bushes and at the same time more profitable for their fruit and wood. But such hazel hedges should not be planted for this reason along roads. The *Beech-bush* makes a good hedge too, but it does not look nicely towards winter, as it keeps its foliage too long.

Linden or basswood also makes good hedges, even where windows in the second story should be shaded. I have seen a hedge more than twenty feet high of basswood trees, where the shading hedge part commenced seven feet high above the ground, below were seen only the stems of six or eight trees standing twelve feet apart like distant pillars. The upper part or branches of said hedge were flattened and twisted. Such a shading hedge would be liked in several parts of our cities, and many an unkind feeling among neighbors, that put up high fences against double houses on single lots could be avoided.

Hedges of arbor vitae or *Thuja occidentalis* and *orientalis* and raspberries, and currant bushes, are very pleasing, even in cities, where some people do not see any use in hedges. The following currant, *Ribes florida*, cercis or Judas tree, Philadelphus, Lilac, *Lycium* or matrimony vine and others, require too much trimming, and that can never give us satisfactory hedges, as they cannot be twisted and will not grow tight enough, nevertheless they answer the purpose of covering up some parts of buildings and yards better than green lattice work, seen almost everywhere.

Hedges must of course be cleaned and trimmed every year, say in June, and when there is plenty of leisure time for it in mild winter days. The June trimming consists in shearing, the winter trimming refers to removing grass and weeds from the footing of the hedges, mulching, replanting new sprouts, laying of new plants for vacant spaces, thinning out, bending, twisting, tying up, etc. Of course this requires skillful hands, but can easily be learned.

What can be done with the trimmed or sheared off branches in June? Do not let them lay, where they fall, as many farmers are doing, even with the trimmed twigs and cuttings from the thorny and dangerous ossage Orange, but rake all thorns together and burn them, and of all other suitable shearings as ironwood, linden, beech, elm, etc., make hay. If you do not like this, rake thorns and all the other trimmings together and pile them up on an. out of the way place as a welcome refuge for rabbits and birds, if you are a lover of the game, if not burn them.

In trimming hedges do not cut them too low, let them be four or four and a half feet high, also avoid leaving them too high, except when you desire a sure protection for your fruit trees on the road-side or for wind-break. The advantage of hedges to board, worm and wire fences as protecting wind-breaks can never be estimated enough.

If you object to hedges as a harboring place for many insects, so I would remind you here, it may be sometimes a harboring place for our enemies, but oftener and more will they be nesting and hiding places for our friends, the most useful insect eating songsters, that now are trying vainly, by the prevailing of our wood and wire fences, to find a sheltering place against rapacious mammals, birds and pothunters.

So let us plant hedges to save our present woods and forests for better timber, which is getting very scarce already; let us plant hedges for ornamentation, for wind-breaks to our orchards and fields, gardens and meadows, for sheltering to our birds, for beauty and for neighborly friendship.

SHADE TREES AND THEIR TREATMENTS.

BY H. M. SESSIONS.

At the meeting of the Columbus Horticultural society at the State University this afternoon, Mr. H. M. Sessions, vice president of the society, and a life-long horticulturist, read a paper on "Shade Trees and Their Treatment." The paper was illustrated by samples of the right and wrong way of pruning, taken from trees growing on the streets of Columbus. The subject is of so much interest to the city at large, that it is here reproduced in full, as follows.—*Evening Dispatch.*

Observing many mistaken notions in regard to the treatment of shade trees, their planting and pruning, resulting from inexperience, and from the habit of following the way of our fathers, without regard to the many improvements that experience and science has developed in this age of progress; we thought that a few points on this subject would not be out of place at a meeting of the Columbus Horticultural Society. The specimens here exhibited are samples illustrating the different modes of pruning to be found on trees growing on the streets of Columbus, showing at a glance the right and wrong methods of pruning, and the necessity of a correct knowledge of how to prune trees.

The plate connected with paper on the opposite page was photographed from the sample exhibited at the time of the reading of the paper.

Trees are planted for their shade, their fruit, and their beauty, and on the prairies of the west for their fuel and their lumber. These three points, shade, fruit and beauty, can be obtained in one tree; but it is not desirable to plant fruit trees on public grounds and parks, or by the road side, or on city streets. Shade trees should be adapted on the soil and location on which they are to be planted. Generally, trees growing naturally in any location and climate will thrive better in that locality than trees removed from other soil and climate. The propensity for getting something that is new and novel, or far-fetched and dearly bought, has resulted in many a failure; proving the old adage true, that "Experience is the best teacher, if it does not cost too much." A correct knowledge on this subject can now be easily obtained from the many books and papers treating on this subject, and from the many schools and colleges established for this special purpose.

Select trees that have a vigorous, thrifty growth, and not those that are stunted by growing on poor soil, in crowded nurseries, or over-shadowed by large trees in a forest. Neglect often results in as much injury to trees as mismanagement.

In transplanting trees it is very important that all the roots possible should be taken up with the tree, without bruising the roots, or stock and branches, by careless handling. Trim off as much of the top as has been taken from the roots, by heading in the long branches, leaving the top well balanced; and always, with a sharp knife, cut off the end of all broken roots, or bruised places on the roots, so that new rootlets will immediately begin to form by the first descending sap; otherwise, the bruised end will decay and prove an injury to the tree by not furnishing any sap to support the formation of the new growth of wood and leaves. Such trees will often wilt and die, as in a drouth. Plant trees the same depth they grew in the field or nursery. Let every variety of the shade tree follow its natural form of growth, and do not allow it to acquire an unnatural form by neglect or injudicious pruning. If, by accident, the form is made defective, judicious pruning can often remedy the defect, or supply the deficiency. A very mistaken plan in pruning trees in Columbus, more than in any other place I ever observed—and one that is ruinous to the beauty as well as the long life of the tree—is the habit of cutting off the limbs from one to four, or even twelve, inches, from the body of the tree, or the limb from which it grew; thereby leaving a spur or stub of the same length. This is all wrong. It leaves a deformity. It will never heal over, except by chance, and then by leaving an unsightly knob. The spur in time will decay; the decay will extend into the body of the tree, leaving a rotten hole, more or less in size, according to the size of the limb, forming a harbor for insects, a home for the squirrel and woodpecker, and thus ruining the vitality and life of the tree. The limb to be removed should be cut off as closely as possible to the body, or branch from which it grew, and parallel with it. This is very important, even though the wound is much larger than if cut off one or more inches from the body of the tree. If cut off close, experience proves that in a few years it will heal over, according to the size of the limb and the vigor of the tree, leaving little or no trace of the wound.

THE TIME FOR TRIMMING TREES.

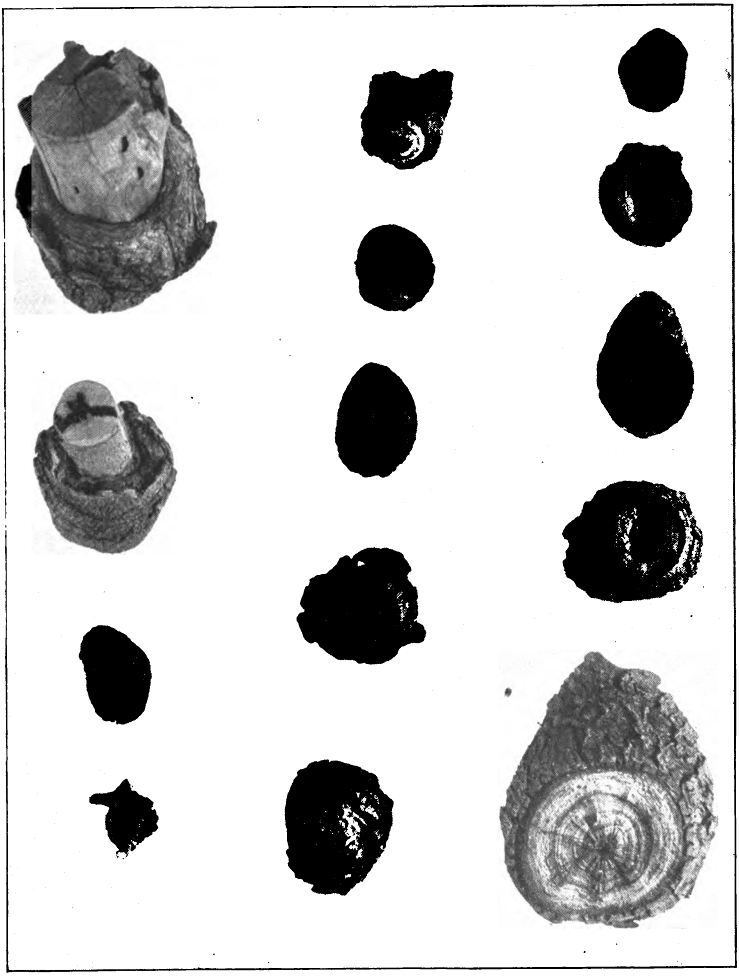
We should say any time of the year when you have time to attend to it, and when the sap does not flow, as when the buds are swelling in the spring. The sap of the maple will flow any warm spell, after every freeze, from the first of December to late in the spring. If trimmed in the fall, the wound may become seasoned so it will not bleed during the winter. We have had the best success in June or July, after the leaf is fully formed, and the decending sap is forming a new layer of wood. Then the wound will immediately begin to heal, and will not bleed as in the spring, especially in the grape and maple. Grape vines, as well as shrubbery and trees, can be safely trimmed any time after they have shed their leaves in the fall ; but never in the spring after the sap begins to flow. Nursery trees are trimmed any time during the summer when the surplus growth has accumulated so as to require it. If young trees are trimmed by an experienced hand the first few years, no instrument need be used larger than the pruning knife or the hand shears. When trees have been neglected, or it is best that large limbs be removed, a coat of paint is very necessary to preserve the wound until it heals over by a new growth of wood.

Never allow but one stock to form the body of the tree, to the height required to form the head, and then allow three or four branches to start out at nearly right angles to the body of the tree ; thus avoiding the breaking down of one branch that forms a crotch, or an acute angle, with another, when loaded with fruit or ice. A crotched tree, or a crotch in upright limbs of a tree, will almost always sooner or later, fall.

TRIMMING FOR BEAUTY.

We could never see any beauty in a tree that had lost its head, and had nothing left but its bare trunk, and a few large stub branches, like the octopus of the sea, reaching out its giant arms, very unsightly in appearance, though less dangerous than the sea monster. Not one chance in a hundred that it will ever recover from the shock, or " make a thing of beauty and a joy forever," as was designed ; but it does make a thing of deformity, and a joy never. Large trees headed in are unsightly, and seldom regain their beauty. Many of the original trees, monarchs of the forest, in the parks of this city, and on other grounds were beheaded years ago, from forty to fifty feet high, and the giant trunks still stand, not as living monuments, but as ghostly dying monuments of the folly of man as can be, and not be dead. The leaves are the lungs of the tree, and if the branches that bear the leaves are cut off, the tree has only to struggle on a few short years and die for want of breath.

It was a great mistake a generation or more ago to have filled this city with so many soft maple trees when the hard,



WRONG. FAULTY. RIGHT.

Samples of pruning taken from the shade trees of Columbus, Ohio.

or sugar maple and elm are so abundant in Ohio, and so readily obtained. Lexington, Ky., is another city, among the many in this section, that is worse off, if possible, than Columbus, in having its streets lined with long rows of unsightly soft maples. The soft maples are a quick growing tree, which is their greatest merit. They also look beautiful when young, filled with the first red blossoms in the spring ; and with their bright crimson leaves amidst the varied autumnal foliage. It has a short life, though a merry one. They are not a hardy tree. The wood is very brittle and easily broken by rain storms in summer and ice storms in winter, with broken branches hanging and dangling in all directions. For this reason they are generally deformed and unsightly ; and as they are trimmed with the knots sticking out, or not trimmed at all, which is often the case, they are very ragged and unkept in appearance, much as a man who needs to visit a barber shop. The symmetrical, well formed, soft maple tree, in old age, is the exception.

The soft maple is entirely rejected as a shade tree in New England, but the sugar maple and elm are universal. We learn that years ago quanities of soft maples were shipped from Massachusetts to supply the demand in Columbus. They grow there abundantly in the low, wet lands and muck swamps with white birches and black alder bushes. Having no tap root, they grow much on the surface with such a thick mass of fibrous roots that no grass can be successfully grown under them. The fact that the soft maple depends almost entirely on its surface roots for nourishment, explains the principal reason why they will not thrive on streets mostly covered with pavements. They grow very thickly and rapidly in these eastern swamps, to 8 or 10 inches in diameter, and every 20 or 25 years, when the tops begin to die, they are cut off, yielding about 25 cords of wood per acre.

The sap of the maple is comparatively worthless, containing so little sweet that it does not pay the expense of its evaporation, taking not less than three barrels of sap to make a gallon of syrup. If boiled in tin it will make a little nice syrup, but if boiled in iron the acid in the sap will corrode the iron and make the syrup as black as ink ; the same as it colors the ax in the springtime when chopping.

Dense shade trees near the house are unhealthy, inducing mildew on everything, and a fungus growth, with dampness and malaria in the air, which the direct rays of the sun would eliminate or prevent. Children raised within such surroundings are generally unhealthy, pale and puny, and grow like potato vines in the cellar. Savage tribes live in the forest shades; civilized man in the open country's sunlight. Trees of large growth should never be set so as to overshadow the house. Shingles will not last long if always kept damp in a dense shade. Therefore, set trees of small growth and shrubbery near the house, so that the sun can dry the air, and the breezes blow away the miasma. Trees are usually set too thick around houses and on city streets, making a complete forest.

Long rows of trees are proper by country roadsides or crowded city streets; but on lawns and parks the best effect is produced, to avoid rows, and arrange them in groups and clusters. Small trees, and large shrubs, can be set between trees of large growth when they are set as they should be from 40 to 60 feet apart.

The growth of trees in forests is always upwards, reaching after the sunlight and air. The lower limbs, which have neither air nor sunlight, die off and thus a kind Providence provides a supply of tall timber trees for the use of man. To remedy this defect of thickly growing trees, the poor and deformed trees should be cut out, and those left should have their lower and dying limbs trimmed off, and thus allow the survival of the fittest. You see a tree that has always grown in the open field, and it will be symmetrical, with branches growing in all directions to as near the ground as the browsing of the cattle will allow. And again, you see trees in a forest, growing next to an open field, and the branches will be growing to the ground on one side only, the side next to the open field reaching their long arms out horizontally, after the sunlight and air, while the trees next in order, and all through the forest, are aspiring upward, higher and higher, for a breathing space.

Hard wood trees of large growth, such as the sugar maple, ash, elm, beech and sycamore, are the most desirable for shade; being hardy and not easily broken, and can be depended upon for a century. These should be set from 40 to 60 feet apart, or far enough to allow them to form a perfect head. If planted too thick, they can be cut out, or will bear severe trimming, and will soon regain their usual rotund form, especially the sugar maple. The soft wood trees, such as the soft maple, willow, and most varieties of the poplar, are not so desirable on account of their being so easily broken by wind storms and ice.

The small trees and seedlings in a forest never make much growth until the forest is cut away; the large trees overshadow them so they can not grow. For the same reason, small trees are seldom or never successfully grown by setting them on thickly shaded streets, to fill a vacancy, in place of trees that have been removed. The young trees having neither sunlight nor air, are gradually forced to die by starvation and robbery, by the older and larger trees that overshadow them. These form a trust, and, like some of the human family, monopolize all the sunlight and air, making it not only the survival of the fittest, or richest, but of the strongest.

That the location and soil of Columbus is well adapted to the growth of the sugar maple, is fully confirmed by the many samples of the original sugar maple trees that are still standing on the public parks, and other grounds in various parts of the city. Not many are to be found in Goodale park, Insane Asylum, or on the Indianola Place ; but in Franklin and City Parks, Imbecile Institution and University grounds, are some fine specimens of well preserved aborigines of the forest, in spite of the scalping knife of the pale face, some time during the past generation. But the finest specimens, and greatest number, of sugar maples are to be found on Woodlawn Avenue and in Greenlawn Cemetery, in the southwestern part of the city. There you can see the sugar maple, as it is, in all its majestic beauty and grandeur. Most of them have escaped the guillotine, and stand upright as God made them to grow, with broad, symmetrical tops, an honor to themselves, and to the soil, and to the state in which they grew ; and a credit, though perhaps not deserved, to the woodman who spared that tree.

The Norway maple is very popular now, and for the short time it has been tested here, is quite promising, but on account of its slow growth, time alone will tell of its desirable and enduring qualities.

Most of the towns and cities of New England and New York state are well adorned with beautiful sugar maples and majestic elms. I will only specify Springfield, Mass., with its magnificent elms on Court Square, and its fully formed sugar maples on North Main and Maple streets ; and in Forest park, the most beautiful park in New England ; and all through the city on all the streets, are maples from trees recently set, to trees one hundred or more years old, that are truly an inspiration ; and this is only one among the many hundreds of towns and cities all through that section with the same adornment. There is no hope of preserving the shade trees on the business streets of large cities ; it is the inevitable ; they must succumb to high brick walls, and solid pavements, with soil and air filled with gas and coal smoke.

One has only to visit the cities of Mt. Vernon and Granville, a few miles distant, to realize what beauty there is in a city

adorned with long rows of large, hardy and symmetrical sugar maples; and also to realize what the appearance of Columbus might have been, if sugar maples had been planted years ago in place of the soft maples, on the suburban and resident streets of the city. Now, when the soft maple has passed its prime, and outlived its beauty, the sugar maple would be in all its glory, in vigor, size and beauty, and ready to live and grow, and stand the storm of another generation, if not another century.

OHIO CRAMBIDÆ.

BY JAMES S. HINE.

Moths belonging to the family Crambidæ abound in pastures, meadows and grass-plots generally during the entire summer. No one species is present in numbers for long periods, but different species succeed each other and so Crambids are usually numerous from April to September in our latitude.

They flourish best on grass lands that are seldom or never cultivated; consequently roadsides, railroad lands and waste places are the breeding grounds of great numbers of individuals and species.

Unless disturbed they remain quitely perched on a blade of grass or other objects during most of the day, and fly in early evening and fore part of the night. They are attracted to lights.

In crossing grass lands during the summer months, one can not refrain from becoming interested in the scores of crambids that rise up before him, fly a short distance and come to rest on a blade of grass on one side or the other. It takes keen observation to detect one of these moths at rest for its wings are folded, and its body is parallelled with its perch so that it presents a very insignificant appearance indeed. This habit of folding the wings has won for these moths the popular name, colse-wings.

Although Crambids are most innocent creatures in the adult state, their larvæ at times cause destruction and devastation over vast areas.

Their manner of protecting themselves and their habits of feeding are such that they are not often seen, except when a special search is made for them. Consequently much injury caused by the larvæ of Crambids is often attributed to some other cause.

Lintner, Forbes, Fernald, Scudder, Felt, Webster and others have furnished observations on their injuries. Corn, oats, rice, cranberries, apples, and grasses, are attacked, and besides it is supposed that species of the genus *Chilo* feed on sedgse.

I spent some time last season in collecting the Crambids of the state, and a list of twenty-one Ohio species has been published in the Fifth Annual Report of the Ohio State Academy of Science. In this paper I shall give each species with such notes as it seems advisable to give.

1. *Crambus girardellus*, The Yellow Striped Crambus, was taken July 7, '96, at Napoleon, Ohio, along the Maumee River. This species is not abundant in individuals, but seems to be widely distributed. Its larvæ feeds on grass, but has never been observed in sufficient numbers to be especially injurious.

2. *Crambus leachellus*, Leach's Crambus, was abundant at Napoleon, Ohio, September 8, '96. It seemed to have a preference for high ground, and was most often seen where June grass, *Poa pratensis*, grew. Therefore it is probable that this plant is preferred by the larvæ for food.

3. *Crambus laqueatellus*. The Paneled Crambus, was abundant at Columbus, the latter part of April and through May. It was most abundant on pasture lands, where various shrubs and bushes were growing. On account of the great number of moths observed, I should suppose that this species does much injury in Ohio.

4. *Crambus agitatellus*, resembles the last named species in appearance and is found in the same situation, but later in the season. The specimens taken were collected June 5, '96.

5. *Crambus alboclavellus*, The White Striped Crambus seems to prefer low ground in the vicinity of water. I took several specimens of this species at Wauseon, June 20, '96.

6. *Crambus albellus*, the White Crambus, is a small species, expanding 16 m. m., and seems to prefer high ground. I took numerous specimens among blackberry bushes in a woods pasture.

7. *Crambus hortuellus*, The Garden Crambus, is a species of wide distribution. It was common at Columbus, London and Wauseon in June, '96, and probably occurs in all parts of the state. In Insect Life, Volume VII, Page 1, Prof. Samuel H. Scudder, gives a full account of this species as a Cranberry insect under the specific name, *topiarius*. He offered as remedies against its ravages, the submergence of the effected bogs with water for two weeks after the fruit was picked in early October. Also burning over in autumn or early spring, all territory which

had been devastated by the larvæ. The latter might furnish a suggestion for checking the ravages of Crambids on some grass lands.

8. *Crambus sp.*, collected at Columbus, June 7, '96. Taken in low swampy grounds.

9. *Crambus perlellus*, The Unmarked Crambus, does not seem to be abundant in the state. The only record made by myself is Columbus, September 20, '96.

10. *Crambus turbatellus*, taken at London, June 11, '96.

11. *Crambus elegans*, the Pretty Crambus, is recorded for Ohio by Prof. C. H. Fernald.

12. *Crambus vulgivagellus*, the Vagabond Crambus, has figured more in economic entomology than any other member of the family belonging to the fauna of Ohio. It is widely distributed in the state. Prof. F. M. Webster reports this species as injurious to corn in Ashtabula county. It is in connection with this species that Dr. Lintner recommends, as remedies, burning over infested meadows in fall or winter, and deep plowing in autumn at anytime after the middle of September. The moths are attracted to lights, therefore they may be collected at trap-lanterns and killed with coal oil or in some other way.

13. *Crambus ruricolellus*, The Rustic Crambus, a poor specimen, probably of this species was taken at Columbus, June 6, '96. It is reported from Ohio by Prof. Fernald.

14. *Crambus teterellus*, The Blue Grass Worm, appears in the state, only sparingly so far as I have observed. Specimens were taken at Columbus previous to '96, by Prof. Kellicott.

15. *Crambus mutabilis*, The Dark Spotted Crambus, appears early in the season. Specimens were taken at Columbus, April 28, '96.

16. *Crambus trisectus*, The Dried Crambus, is an abundant species in central Ohio. The first specimens were taken April 26, '96. The insect has been observed and collected by Professor Kellicott for several years previous to this date.

17. *Crambus caliginosellus*, The Sooty Crambus, was taken at Columbus, May 23, '96. Specimens were taken at London in June. Does not seem to be common.

18. *Crambus luteolellus*, The Yellow Crambus, was taken at Columbus, June 7, '96. I have not found it common.

19. *Argyria nivalis*, is a common species on grass lands at Columbus. The first specimen was taken April 27, '96. Professor Kellicott has taken them in previous years. They seem to prefer high ground, and are most often taken among briers in wood pastures.

20. *Chilo comptulatalis,* was first observed at Sandusky by Prof. Kellicott, who took one female specimen July 24, '96. The next day I collected a great number of specimens, males and females. I suppose the larvæ of this species feed on the large sedge, *Scirpus lacustris,* for I took the moths where these plants grew in abundance. In fact, to take them I waded in the water where the sedges were growing and when the moths flew up took them with a net.

21. *Chilo forbesellus,* was taken in the same situation, and on the same date as the last named species.

NUT BEARING TREES FOR SHADE AND ORNAMENT.

WILLIAM R. LAZENBY.

Probably there is no other civilized nation where the appreciation shown for shade and ornamental trees, is so slight as in the United States. We find here little of that genuine, hearty love of trees, manifested by the people of other countries.

There are comparatively few who know our noble forest trees by name, and the number is still less of those who delight in their artistic grace and beauty or are in any way impressed by their rugged strength and magnificent proportions.

Our age is too eminently practical to see beauty absent from utility. To those who can only be induced to plant trees because it will pay—pay in dollars and cents, I urge the superior advantages of our nut-bearing trees especially for road side planting. In some sections of Germany the roadsides are lined for miles and miles, with English Walnut trees. These trees occupy what would otherwise be waste land and from them comes a goodly revenue. The nuts are chiefly used for oil.

There is no country that possesses such a numerous variety of valuable nut bearing trees as America, and the most of our foreign nut trees can be grown surely and thriftly in various states of the union. Among our natives, the common American chestnut is one of the best, and this tree finds a congenial home in many parts of Ohio, and is well suited for roadside planting. Several species of hickory might also be used. For ornamental purposes there are few trees that excel the hickory in variety and beauty of foliage. The nuts are also valuable, the better varieties always commanding a good price in the market.

Among the more desirable sorts are the better varieties of shell or shag-bark, and the white heart hickory. In the most favorable sections of the state the Pecan nut can be easily grown. In addition to the above we must not fail to mention the black walnut and butternut. The former can be grown both for nuts and timber, while at least a few specimens of the latter should be found upon every farm.

The English walnut, or as it is more properly called, the Madeira nut, is a species of the same genus as the black walnut and butternut. The tree closely resembles the butternut, and one unacquainted with it might think it identical.

It is less hardy than our native species, although it has been known to thrive in Northern Ohio. This nut is annually imported in large quanities, and ought to be produced in this country.

We have, in places at least, a suitable climate, an abundance of land, and many willing hands out of employment. It is certainly poor economic policy to be constantly importing an article which we can ourselves profitably produce. I cannot speak confidently as to the practicability of raising various varieties of Spanish and Japanese chestnuts in Ohio. All of these foreign varieties produce larger nuts than our native ones, but as far as I have tested them, none are as good in quality.

Columbus Horticultural Society.

QUARTERLY JOURNAL OF PROCEEDINGS.

VOL. XII. COLUMBUS, O., JUNE and SEPTEMBER. Nos. 2 and 3.

PROCEEDINGS OF THE SOCIETY.

APRIL.

Meeting held in Horticultural Building, Ohio State University, on Saturday, the 24th of the month.

Mr. Wilcox of the Committee on Botany gave a report which is published in full on another page.

Mr. Logeman said that he noticed a general lack of shade trees around the dwellings of our farmers, and expressed a desire that agricultural and horticultural societies use their influence toward securing a more appropriate observance of the primary objects of Arbor Day. He pointed out the necessity of having trees and shrubbery for the protection of insectiverous birds.

Mr. Janney, of the Committee on Library reported that the following volumes had been bound and placed on the shelves:

Cincinnati Society of Natural History, volumes IV—XVIII inclusive; Mehann's Monthly, volumes I–VI inclusive; Garden and Forest, volumes IV–IX inclusive; Canadian Plants, Parts I–VI inclusive; and Bulletin of the Scientific Society of Denison University, volumes I–VIII inclusive.

Prof. Lazenby gave a short report on fruits and exhibited specimens of lettuce and cauliflower from the green-house.

The following bills were presented and ordered paid:

J. L. Trauger, for binding,	$15.95
Terry Engraving Co., for plate,	6.00
Spahr and Glenn, for printing, etc.,	157.00
Garden and Forest, Subscription,	4.00

The Society then adjourned.

MAY.

A pleasant meeting of the Society was held at Westerville, May 22, 1897.

Mr. Logeman gave a short report on botany.

Mr. Phelps reported upon fruits, stating that apple blossoms were plentiful, but the prospects of a big yield are lessened by the appearance of the canker worm in great numbers.

Mr. Hine stated that the canker worm, if taken in time, can be easily controlled by the use of the arsenides.

Mrs. C. E. Sharp announced that a larva of peculiar habits was injurious to her rose bushes. She stated that the larva rolls the leaf from one side toward the center and fastens it with webs. It lives and feeds within the retreat thus formed. Mrs. Sharp asked information on the species.

Mr. Hine replied that the insect is probably a Tortricid, may be *Cacœcia rosaceana*, and could be controlled by hand-picking, or by spraying with pyrethrum.

Prof. Lazenby read a paper on the "Care and Management of Flower Beds" which brought out an extended discussion. About twenty varieties of bedding plants which the Professor brought for purposes of illustration were distributed among the members present.

There being no further business the Society adjourned.

SEPTEMBER.

The September meeting of the Society convened in Botanical Building, Ohio State University, on Saturday, the 25th.

Prof. F. L. Stevens reported an abundance of mildews this season, and referred to the common one on various species of *Polyganum* as an example of the distribution of a single species.

Mr. H. M. Sessions exhibited some specimens of "beach grass" from the shore of Lake Michigan; also of the tall meadow oat grass, which he recommended as a good variety to raise for hay on hard clay land.

Prof. Kellerman stated that his recent experiments with potassium sulphide is another proof of its value as a preventive of wheat and oat smuts. In a comparative test in which the above fungicide and *cerespulver* were used, the results in all cases were slightly in favor of the potassium sulphide treatment. He also found that formaline, in the proportion of one part of formaline to 500 parts of water, prevented oat smut; and was of the opinion that one part of the former to 1000 of the latter would be effective.

Prof. Kellicott mentioned several instances where he had observed English sparrows attacking the periodical cicada, and oftentimes killing many more than they desired for food. He stated that the horn fly is a serious pest to horses sometimes. A case of the kind came under his observation the past summer in western New York.

Mr. Gill announced that he had met with some success in preventing the oviposition of periodical cicadas on his small apple trees by painting the trees with a mixture of rosin and lard. He stated the results would have been more satisfactory, had the application been made earlier in the season. Mr. Gill also stated that the great number of sparrows in the town of Nelsonville and suburbs kept the cicadas in check, but in the surrounding country where not many sparrows were seen the insects did immense damage.

H. Warren Phelps, of Westerville, sent reports on fruits and vegetables, which were read by the Secretary. These reports are published below.

Prof. Kellerman gave a paper on "The Smut of Sorghum," and W. R. Beattie one on "Cannas."

A fine plate of grapes composed of several varieties, among which were Delaware, Niagara, Diamond and Concord, were placed on the exhibition table by Prof. Kellerman. The members present were invited to sample these at the close of the meeting.

The thanks of the Society are due Mr. Beattie for decorating the hall so pleasantly.

A bill of $54.75, from Spahr & Glenn, was presented and ordered paid.

The Society then adjourned.

JAMES S. HINE, *Secretary.*

THE EDITOR'S TABLE.

THE present number of the JOURNAL contains a valuable paper on greenhouse management by W. R. Beattie. The paper is valuable because it is the result of actual experiments made by the author himself.

A PAMPHLET in which is published the proceedings of the National Convention for the Suppression of Insect Pests and Plant Diseases by Legislation, has just come to hand. The pamphlet comes from the U. S. Department of Agriculture, and places before the public a copy of the bill which was adopted by the delegates to said convention held in Washington, D. C., March 5 and 6, 1897. The measure has many friends among practical and scientific men, and the *Journal* has hopes that it may become a law at the coming session of the national legislature.

THE periodical cicada made its appearance the past summer as predicted. A great many important observations, on the species, have been added to those made in former years. Columbus was supposed to be west of the infected district, but the fact that specimens have been taken in the suburbs of the city indicates that brood XV is gradually spreading over more territory. A great deal of damage has been done to fruit and shade trees in various parts of this state. In Medina county, where I took some notes on the species, maple trees on the edges of woods and in fields, seemed to receive most injury.

THE horticulturists of Ohio have had the opportunity this season, of attending at Columbus, a meeting of the American Pomological Society. The sessions were held during state fair week, consequently, many in attendance at the fair were present at one or more of them. Col. C. L. Watrous, of Des Moines, was elected president for the ensuing year.

A NEW book of much interest to fruit growers has been issued recently. The title of the work is Principles of Fruit Growing, by Professor L. H. Bailey of Cornell University. Although strictly scientific, it is full of information for the practical fruit grower. It takes up questions of the greatest importance and treats them in an able and instructive manner. McMillan and Company, of New York City, publish the book and will send it to any address, post paid, on receipt of $1.25.

THE fine appearance of the foliage of trees and shrubs in general, has been noticeable this season. It may be accounted for on the ground of scarcity of forest insects and fungous diseases.

REPORTS OF STANDING COMMITTEES.

REPORT OF COMMITTEE ON BOTANY.

BY E. M. WILCOX.

The following report of the Committee on Botany contains a number of notes and observations of interest to all nature students, and in these notes no attempt has been made to be orderly in the arrangement of subjects.

Several fungi have been collected upon the campus of more or less interest to us all. The first one a puff-ball, *Bovista*, is found about the campus in rather large numbers. The group to which it belongs is characterized by having the spores produced on the inside of a leathery, sac like body called the peridium. The spores escape through irregular or an often definite opening at the top of the plant. The inside of this sac is filled with a dense mass of threads, each of which arises from a large base and branches dichotomously, or in twos.

The commoner genus, *Lycoperdon*, also has these threads, but they never show us this definite branching. In this latter case the threads are irregular as to branching, and about equal in size throughout.

The small *Cyathus*, or bird's nest fungus, was found here by W. Fischer. It is quite generally distributed over the state. The very small, egg like bodies at the base of the cup are each attached to the sides of the cup by a pedicel or stalk. The spores are contained in these "eggs," or sporangia.

Few persons clearly and fully appreciate the great variety and beauty of the common forms of the so-called "Higher Fungi." These, as most all fungi, are undoubtedly to be considered a series of forms that have mostly lost by retrograding their sexuality. Their complexity is a certain indication of their having once possessed sexual organs, but they have so changed their mode of life as to render their reproduction possible by asexual means simply.

The small threads or chains of cells that are called hyphæ are mainly instrumental in rendering this asexual reproduction quite sufficient to maintain the species. These hyphæ, compacted together, form the white, branching, root like bodies, "the spawn" of the mushroom, as well as the white, downy appearance of our mildews, etc. The purposes of asexual and sexual reproduction can be expressed briefly as follows; by asexuality the species is capable of producing a much larger number of individuals than is possible by sexual reproduction.

In the way of flowering plants, several interesting things have come to my notice during the spring. Skunk cabbage was out of flower (in fruit) before February 1st. The rapid drainage of this section of the state renders the rapid increase or spread of this plant impossible. In some parts of western New York, it has become a very bothersome meadow weed—especially is this true of the lower lands, which in many cases are undrained, and are used for hay or pastures year after year.

Each year a seemingly increasing number of spring beauties, *Claytonia perfoliata*, greets us in our University grove notwithstanding the onslaught made on them by the omnipresent youngsters. A great decrease in numbers of the *Erigenia*, the harbinger of spring, is noticeable, not only on our campus, but wherever the ground is subject to frequent disturbance by man or beast. The *Erigenia* does not enjoy being covered, even by other plants—the *Claytonia* however, is perfectly at home in quite a dense sod.

During the summer of 1893, quite a number of abnormal specimens of the May-apple, *Podophyllum peltatum*, were found by my father, A. F. Wilcox, in a small wood north of the city. The specimens were abnormal as to position of the flower and in one case the flower was terminal, with no sign of a leaf. The plants were all found in a small area, not over 20 rods square. The spot was watched during last summer, but only one or two abnormal individuals made their appearance. This spring, however, a large number of abnormal specimens have already made their appearance. A study of the whole plant will be made during the vacation.

It is desired that specimens of any and all strange or interesting plants be brought or sent to me, or other members of the Committee, by members of the society as convenient. It is the intention of the Committee to pursue county investigations further during the summer, and we wish your help.

April 24, 1897.

OCTOBER REPORT ON FRUITS.

BY H. WARREN PHELPS.

In the northern portion of Franklin county apples were not plentiful, except on trees well protected from southwest winds. A few trees where the smoke from fires built in houses settled down through the tops and branches in early morning were well filled with apples, and the fruit was fair. During the past month, however, the great heat has caused very much of this fruit to fall, and nearly all of the apples on other trees have fallen.

Grapes rotted badly during the three first weeks of August. Many owners cut out the top leaves, in order to let in the sun's rays, and thus dry out the fruit. In other vines the leaves turned brown and fell off. In either case the sun burned the grapes during the heated term of three weeks in September. The grapes on many vines are thus of very inferior quality—some of them entirely dried up. One-third of the grapes are thus worthless. On vines where the leaves were properly thinned off, the grapes are of good quality, are very plentiful and have ripened well.

Quince bushes have suffered from blight; many bushes have died. Where the dead leaves and twigs were cut off and burned as soon as the wilting and changing of color was noticed the trees have survived; in some cases the bark was cut lengthwise of the twig for several inches—even feet—thus giving opportunity for the limb to expand and the sap to escape. A few bushes were treated by putting the water in which the table dishes were washed around and under the bushes. Under the latter treatment, the bushes became more vigorous, the leaves bright green, and the fruit is healthy, very smooth and of good color.

The cutting back of the twigs and dampening the ground under the bushes has had a good effect wherever practiced.

All trees and vines have been greatly benefitted by watering the surface of the ground under them during the heated term, being careful not to put any water on stem of tree or vine during the heat of the day.

Apples of the winter varieties are very scarce, and there are very few winter pears.

REPORT ON FRUITS AND VEGETABLES.

BY H. WARREN PHELPS.

I have been examining the fruit buds and find that some of the apple trees will be full of blossoms while other trees will have but few blossoms; the trees seem to be very healthy; many bore large crops of fruit last season. There are many orders for trees being filled just now, which indicates that the fruit industry is gaining in interest. Plum trees will bloom quite full, also cherry trees. The plum and cherry trees seem very thrifty, as also do pear trees. The peach is generally killed, yet the trees are in fine condition. There is very little of the knot on plum or cherry trees. Some of the quince bushes have died; the bark cracks open and scales off. So far I have not succeeded in finding any insect which might have caused this; it seems to be a disease. All bushes and canes are in fine condition, and the prospect for a large crop of currants, gooseberries, raspberries and strawberries is excellent.

The season has been cold and wet, so as to prevent the early making of gardens, and with the exception of peas and onions very little planting was done previous to the 22d of this month.

The hard freeze of the night of the 19th did much damage to young clover plants, and to early sown oats; retarding the growth of grass and wheat plants; but it probably has been the means of keeping back fruit buds. Ice was formed to a thickness of three-fourths of an inch.

There will be a large output of potatoes, many being planted during the past three days. There will be more than the usual amount of ground planted to beets, carrots and cabbage, for the purpose of feeding to live stock. There is also some stir in sugar beet planting.

April 24, '97.

OCTOBER REPORT ON VEGETABLES.

BY H. WARREN PHELPS.

Potatoes, where dug, have been found to be very small and few in the hill; the crop will not be more than one-fourth the usual yield.

Beets are generally a good yield; very good quality. The sugar beets have grown vigorously and many of them have attained fully five inches in diameter and ten inches in length. There are many small spaces planted on different kinds of soil; for the purpose of having an analysis to test the sugar producing qualities of our soils.

Turnips have made very slow growth; those very early sown have proven dry and tasteless.

Sweet potatoes are yielding fairly well.

Pumpkins and squashes are not plentiful, but in some soils have made wonderful growths; being large and fair—which would seem to prove that great care and attention will produce these two almost indispensable articles for family use.

Tomatoes have grown well where vines were planted in soils well adapted to their growth, and good cultivation given, in season.

The same can be said of melons; yet both have been rather short in yield. Farmers pay too little attention to them in season; giving them more attention too late in the season, when they have time to spare from other crops.

Not near so many cucumbers have been raised as the demand requires. Vines have died; the manner of watering the vines is not the best to prolong the life of the vine. Water should not be applied directly to the vine during hot, drouthy weather, but should be applied to the soil a few inches from the main stem of the vine, so that the small roots of the vine can take up the moisture.

Cabbage has been neglected—the drouth has prevented good growth.

Beans are in good demand, and have matured well.

The hard frost of the 18th killed all the vines.

COMMUNICATIONS AND DISCUSSIONS.

SMUT OF SORGHUM.

BY PROF. W. A. KELLERMAN.

Sorghum may not be grown in very large quantities in this state, yet multitudes of farmers have a small area for home use. It will, therefore, be of some interest and importance to know that it is subject to the ravages of two different species of smuts. One of these attacks the individual grains, causing them to become somewhat enlarged and usually much elongated. The panicle, or head, presents nearly the usual appearance, at least the general shape and size is but little if any altered, though careful inspection reveals the dull color and stuffy appearance characteristic of the disease. When the grain is crushed the black powder is exposed, resembling in appearance the grain of wheat affected with stinking smut.

The technical name of this form of sorghum smut is *Ustilago sorghi.*

The other smut is more conspicuous and in general appearance resembles the corn smut. It converts the whole head, or panicle, into a mass of smut. It does not occur on other parts of the sorghum plant. It differs from corn smut also in exhibiting a covering of pure white membrane when it emerges from the leaf-sheath. I need not speak of the microscopic differences between these smuts, and between these and other smuts which occur on corn, wheat, oats, barley, and numerous other plants. This smut—head smut as it may be called, to distinguish it from the grain-smut described above—has been named by the botanists *Ustilago reiliana.*

This latter smut is the more interesting of the two. It has been known since 1875, when it was first described by Kuehn, a German investigator. It was found in Egypt and southern Europe on sorghum, on sugar-cane and corn. In 1890 it was first reported in this country by Mr. Swingle and myself in Kansas, growing on sorghum raised from infected seed. The same year it was found in New Jersey.

A few weeks ago I found it in abundance in a field of sorghum in Shelby county, probably the first that has been reported for this state. It has been found growing on corn in Kansas by Mr. Norton, formerly assistant in the Kansas Experiment Station.

When connected with the Kansas Experiment Station, I determined experimentally that the infection of the sorghum by these smuts was through the seed grain. Twenty-five plots were planted, fifteen of them with infected seed. Of the fifteen, nine of them, or 60 per cent, produced smut.

Since this is the case, it is right to hold that treating the seed with a proper fungicide would prevent the smut, as in case of oat-smut, barley-smut, and stinking smut of wheat. An experiment, one season only, showed that hot water was thoroughly efficient in this case, as it is now universally known to be for the smut mentioned immediately above.

I might add, in conclusion, that the millet-smut is a species (of course differing from all of the foregoing) that attacks the individual grains of the head, and occasionally does considerable damage to the crop of millet. I will renew my request that specimens of sorghum smuts and millet smut be reported to me with specimens whenever found occurring, since I desire to extend my studies of these parasites.

NOTES ON CANNAS.

Among the plants of the flowering or ornamental class that have recently come into prominence, the canna stands near the head of the list. A few years since popular taste tolerated all manner of imitations of something unnatural and by clipping and shearing nature's effects were destroyed or even contorted to such an extent as to render the species unrecognizable. Imagine trying by the aid of the knife to so change the features of a man to resemble those of some animal and you would have a parallell case to the one just mentioned, of shearing plants to make them represent anything but what nature designed that they should.

Today we seek to imitate or rather aid nature in producing or following its own course. And as a plant for which nature will do the most when used as a decorative plant on the lawn or in the park, none has as yet been found to equal the canna, especially since the dwarf or flowering sorts have been introduced.

There is a distinction that we should remember between plants of our own region and those of the tropical regions, as regards their treatment during winter or their period of rest, for while our native plants rest wet and cool or frozen, those of the tropical regions rest dry and only go into a state of rest for want of moisture ; so we should always remember that plants of a tropical nature should be stored in a dry, warm place, and to this class belong the canna, colocassia (caladium), etc. The best plan for storing canna bulbs is to cut off tops, leaving stubs three or four inches long and allowing most of the soil that readily adhers to the roots to remain, then store under greenhouse bench, on a bed of gravel or coal cinders, where they will not get any moisture from the walks or soil underneath ; it may be necessary to throw a little water over them occasionally to prevent the bulbs shriveling, but care must be taken, and if kept in a cellar should be placed on boards raised from the floor and near the furnace or laundry stove. Colocassia or caladium bulbs are best kept by laying or hanging directly over the furnace or stove, and as they dry the remains of leaf-stems and small roots can be taken off until only the smooth bulb remains. Towards spring canna bulbs may be cleaned off in the same manner. If larger number of canna plants are wanted for the next season's planting, they may be had by dividing the old bulbs to single eyes and planting in boxes or pots during the early spring, thus they will have a start by the time they can be set in open ground. Cannas are easily injured by frost and should not be planted out too soon.

As to care during the growing season, all that is needed is plenty of water and a deep, rich soil, generally the richer the better. Aside from watering, no special care is needed except to occasionally go over the flower-spikes and pick off the lower flowers as they fade. After frost has rendered the foliage and flowers unsightly the tops may be removed, and the bulbs are best housed before the rains set in and soak the soil about the roots.

VARIETIES.

The old Robusta and common foliage sorts are no longer effective, even for large places, for we have numerous sorts that have fine foliage and large, showy flowers as well. Among some of the best varieties that might be mentioned are Chicago, Florence Vaughn, Madame Crozy, Paul Marquant, Alphonse Bouvier and J. G. Cabos.

The new cannas, Austria, Italia and Burbank are very fine for indoor growing or where shaded from the extreme sunshine, but burn when planted in the open ground.

APPLICATION OF HEAT TO GREENHOUSE STRUCTURES.

BY W. R. BEATTIE, M. S.

It is not the purpose in this thesis to repeat the history of progress made in greenhouse heating during the short period of its use prior to 1880, but rather to examine the present methods and look toward the future, aiming at perfection in this comparatively new field of research, and to set forth some of the more recent and scientific applications of the subject in all of its phases. It is one thing to get the heat into the atmosphere of the greenhouse and quite another thing to keep it there ; so the first consideration should be to build houses as nearly air tight as possible, with a minimum amount of exposure and tight fitting doors, so that the heat may be retained.

One of the most perplexing questions for the man who contemplates constructing a greenhouse to decide is what kind of heating to put in ; to-day the old flue would, of course, not need be considered and the choice would be between steam and hot water.

Professor Taft, in his book upon greenhouse construction, after discussing methods and advantages of each system, sums up as follows:

"Steam needs constant attention. Temperature will ordinarily be less regular with steam heat than hot-water.

"First cost of steam plant will be fifteen to twenty per cent less than hot-water, and a trifle less than hot-water under pressure.

"On the other hand, the cost of fuel for hot-water will be twenty to twenty-five per cent less than for steam.

"On the whole, for a place not exceeding ten thousand feet of glass, hot-water will, in most cases, be found cheapest and most convenient ; but above that amount of glass steam might be advisable, as a night watchman is needed anyway."

Recent experiments at the establishment of Henry A. Dreer of Riverton, N. J., made by Mr. Eisle, seem to confirm the results of past experiments, demonstrating the economy of hot-water heating, even upon a large scale. The observations of Mr. Eisle were taken from two sets of houses, one of 45,000 feet of glass heated with steam and the other of 53,000 feet of glass heated with hot-water. Heat for the steam heated plant was furnished by three tubular boilers aggregating one hundred and sixty horse power ; these consumed 265 tons of coal at an average cost per thousand feet of glass of ten dollars. Heat for the hot-water plant was furnished by one hundred and thirty-five horse power boilers consuming 248 tons of coal at an average cost of eight dollars per thousand feet of glass.

As for my own preference, and leaving out of account first cost, I would choose hot-water for several reasons, but steam has advantages at times not found in any other form of heat; for instance, in checking mildew or rot steam is more effective. On the other hand, however, the attention required for hot-water is never nearly so great and is safer in case of a sudden change from warm to cold during the night.

In order to employ the advantages of both systems, I have successfully combined the two systems in one. During the past winter, have operated a small boiler built upon this plan the working of which has been entirely satisfactory, and which, I think, meets all the requirements of either system taken separately. The only practical difference between this and any steam boiler is that it has larger flow and return openings and the system is supplied with an expansion tank.

The plan of this boiler is shown in Fig. I.

The drum or tank above serves as a reservoir and supply for the water tubes below which form the boiler proper; of course this tank would not be really necessary for the hot-water system, but it increases the water volume in the boiler, which is quite an advantage, as the water tubes hold but a small amount of water and cool quickly after the fire goes down, should such thing occur; the tank, however, is indispensable for steam use, in order to have a water level and a steam reservoir from which pipes are supplied. Starting with the entrance of water to drum from returns it passes by action of gravitation downward through the circulating tubes at rear of boiler, then upward into heating tubes toward front of boiler re-entering the drum at front of boiler, having made a complete circuit around and through the flames.

When steam is being used, the water should stand about half way up in the drum, circulation being the same as with hot-water, the steam being formed just as the water passes through the tubes at the hottest point over fire; then the steam rises into the drum above by means of the upper circulating tubes and thence to the flow pipe and the houses; if this arrangement be followed the boiler will be noiseless in its action when steam is being used.

As to the amount of fuel consumed by each method, it was found that more heat units were produced per pound of coal when using steam, because then, and then only, could enough draught be allowed to secure good combustion, but could there have been enough load or radiating surface to have worked the

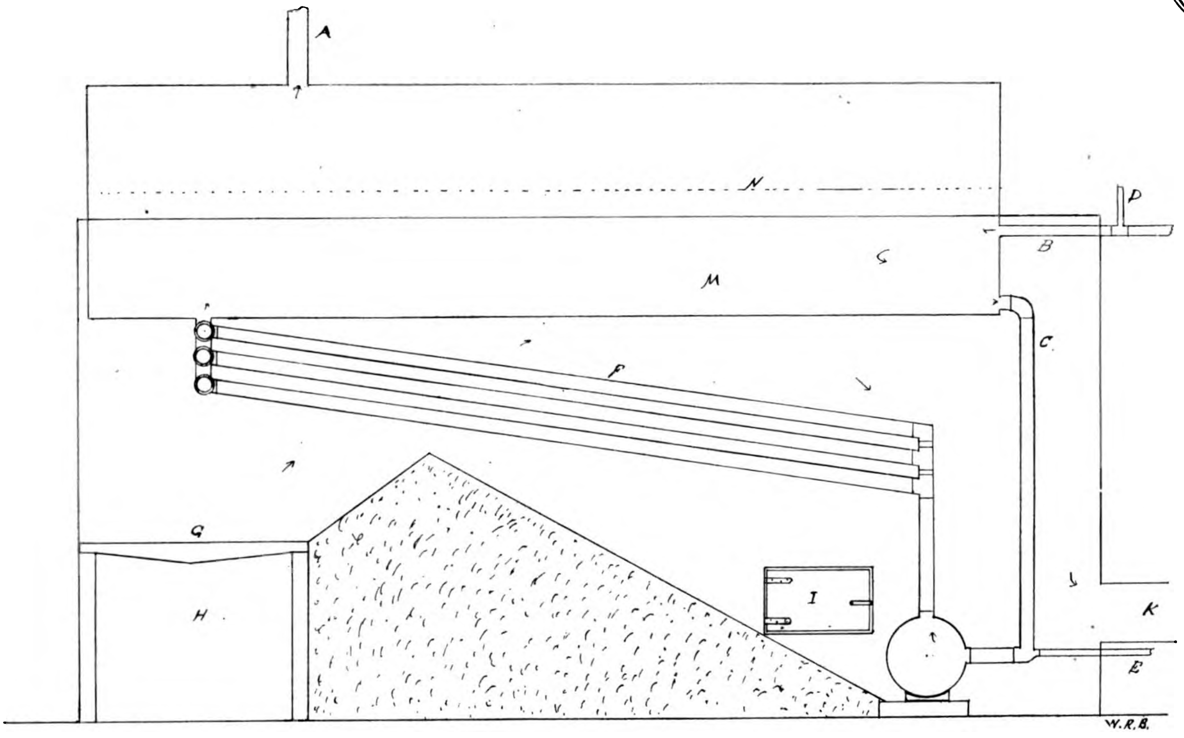


Plate I

Plate I. Showing Side View of Boiler—*A* Flow Pipe. *B* Return Pipe. *C* Rear Circulating Tube. *D* Supply Pipe. *E* Discharge Pipe.

boiler to its full capacity the results would be stronger in favor of the hot-water system. When firing boiler at Delaware which was built upon this principle, the indications were that it took less fuel to keep a given temperature with steam than with hot-water under pressure, but am satisfied now that the difference was due to lack of piping in houses, so that heat was not utilized when water was being used; steam will part with its heat more readily, thus forms a quicker medium for the transmission of heat from the fire to the atmosphere in the houses; economy in amount of pipe put in for radiation surface is poor economy, as it constantly takes off the profits by allowing expensive heat to pass up the chimney instead of carrying it to the houses, and a surplus of radiating surface is more desirable than the opposite.

The greater the difference of temperature between the fire and the water in the boiler the more heat will be taken up by the water, and if economy of fuel were the main object sought, enough radiating surface should be provided to give off the necessary heat without heating the water in the boiler above 195° or 210° F.

By combination of the two methods the first cost may not be so great, perhaps only a little more than for steam alone, the heater can be run with hot-water during mild weather and changed to steam during severe cold, when it may be advisable to be about the houses most of the night anyway. By changing to steam quick results may be had in case of sudden change of temperature.

Opposed to combined water and steam methods might be mentioned the waste of water in making the change, as all the pipes and a part of the boiler have to be emptied and the water drained off, labor and attention required in making the change, liability to leakage caused by changing, for joints of boiler and also those of pipes will invariably leak when cold water is put into them after using steam for a few days.

As for size and arrangement of pipes for the combination, they may be practically the same as for steam; the hot-water being used only in mild weather, so rapid circulation is not required.

Where any low places or pockets occur, in which water would collect, drips should be put in connecting to the return pipe with a valve so they can be closed when using hot-water.

I do not deem it wise to use pipes that are smaller than one and one-fourth inch for greenhouse heating; but where, as is often the case, one inch pipe can be bought very cheaply a great many lines might be used as returns, even then crooks and turns should be avoided.

AUTOMATIC HEAT REGULATOR.

Some years ago, the Johnson Electric Co. of Cincinnati put in two automatic regulators calculated to control the temperature of the two rooms of the University conservatory, but they were never properly adjusted and so failed in doing the work ; during the past winter, however, one of them has been successfully employed to regulate the supply of steam at the end of the tunnel. Thus far automatic controllers have been too complex, getting out of order easily, and too expensive for use in commercial establishments.

THERMOSTAT ALARM.

Of far more practical value, and along the same line of the heat controller, comes the thermostat alarm, which is an apparatus for turning in an alarm in case the temperature of the greenhouse falls below a certain point. My thermostat consists of a strip of zinc and a strip of galvanized iron, each twenty inches long and one inch wide, riveted together and suspended to a wood support by one end, the other end being allowed to swing free. To the strip is fastened one wire of the batteries, the other wire being fastened to a screw so set that when by cooling to a certain degree, the zinc strip contracting more rapidly than the iron, the lower end of the bar is drawn in contact with the screw, thus the connection is made and a bell placed at any convenient place is started ringing. I find two Leclanche cells sufficient batteries where the system does not use more than 500 feet of line wire.

For illustration of thermostat see Fig. II.

Any number of thermostats may be placed in different houses, arranged parallel upon the same line and worked by the same batteries, and connecting to the same bell.

VENTILATION.

Next to heating and watering, ventilation requires most careful attention and, in fact, is a part of heating and controlling temperature. It should be so managed that overheating should never occur, for too much heat is usually more detrimental than too little heat and the air should be changed without allowing draughts of cold or drying air ; doorways or large openings never form good ventilators, far better use small openings and ridge vents.

While there are several good kinds of apparatus for hoisting ventilators, no successfully working automatic hoister has as yet been devised ; but such arrangement may soon be brought

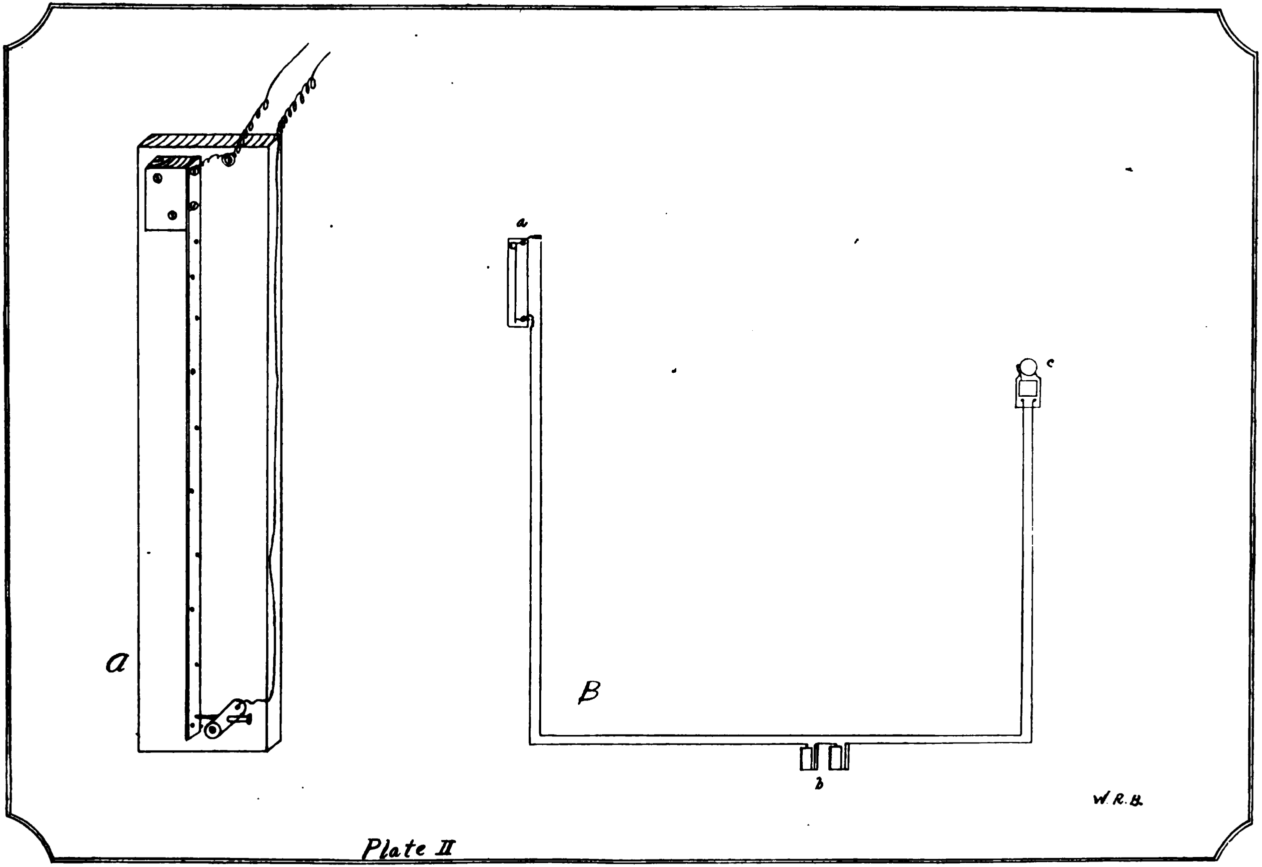


Plate II. Thermostat Alarm.—*A* Details of Thermostat; the zinc side of bar being placed next contact point. *B* Plan of Wiring. *a* Thermostat in Greenhouse. *b* Batteries in Cellar. *c* Bell in Residence.

into practical use by the improvement of the thermostat and the ventilators made to raise and lower as the temperature requires, the power being furnished by water.

WARMING WATER.

Warming water for watering during cold weather may seem unnecessary, but when it is taken into consideration that the average temperature of our city water during the colder part of the year is only about 50 degrees, and if warmed to 80 or 90 degrees that amount of heat goes direct to the soil where it is most needed to aid growth. Overwarming, however, should be avoided, as it produces a soft growth and causes disease. Warming water may be accomplished by letting steam escape directly into a tank of water, by enclosing the water pipe within a steam pipe, or by passing the water pipe over the fire and having it so arranged that it can be withdrawn when not in use.

APPLICATION OF HEAT TO SOIL AND ATMOSPHERE.

It has been observed for several years that beets cannot be profitably grown under glass except in hot-bed where all the heat is underneath and where the soil is warmed to 85 or 90 degrees. During the season of '95 and '96, we had a large per cent of cloudy, warm days when lettuce made practically no growth. Just at this time prices were advanced, as is usual at such times, and it became very desirable to push growth, but if more heat be applied the rot would begin its work, so that heat would have to be shut off in order to prevent entire loss of crop; these conditions led to the following observations:

First—That rot is produced or thrives best in a warm, moist atmosphere and will not do great damage if air temperature be low, even with a large amount of moisture present.

Second—That the temperature of soil in benches maintains only about the same average as the lowest average of the atmosphere in the greenhouse, while the average highest temperature of the air may be twenty degrees above the average lowest temperature. Thus it occurred to me to try raising the temperature of the soil and giving the air plenty of ventilation, thus keeping out mildew and rot by keeping the house cool.

For the experiment, a raised bench 4 by 24 feet in size and seven inches deep was selected, situated in a house with overhead piping. On the bottom, inside of this bench, were laid four lines of one inch pipe, two as flows and two as returns; these pipes were connected direct to boiler with cut-off valves, so that they could be run independent of regular piping in house or shut off altogether, and it was found that these pipes would heat entirely too rapidly and had to be partly closed off. The soil was placed directly upon them, covering them to a depth of about five inches ; with the soil at 54 degrees to start with, this amount of piping would easily raise it to 75 degrees in one hour, with hot-water heat, and when once warm would remain so for nearly a whole day.

Upon this bed was planted plots of lettuce (Grand Rapids) and beets, with equal space unheated and similarly planted for comparison. The beets upon the heated plot yielded a fair crop, yet not enough to pay well, while those on the unheated all grew to tops and yielded nothing.

The average weight per bunch of lettuce on the heated plot was six and five-sevenths ounces, and on the unheated plot four and three-elevenths ounces, or a gain of about 57 percent over the unheated. Of course both plots, being in the same house, are subjected to the same atmosphere and would each influence the other to some extent ; increase in weight on heated plot was evidently entirely due to heat applied to the soil.

In this experiment the average soil temperature for the heated plot was about 77 degrees, and of the unheated plot 55 degrees, with an average atmospheric temperature of 60 degrees. I did not, however, consider the experiment a conclusive one, as the rainy season was over after the test had been under way for about two weeks ; but had the conditions that prevailed during the first two weeks continued throughout, the percentage would have been far greater in favor of the heated portion ; for the plants on the heated portion stood fully two inches above those on the unheated. Lest some one should accuse me of putting the better plants upon one or the other side of the experiment, I called in an old gardener, who knew nothing of my purpose, and had him divide the plants into equal lots. It was soon found that the heated plot required about twice as much water as the unheated, and that the pipes dried or burned the soil that came in contact with them. It might be well to combine soil heating with sub irrigation, by running the pipes through the tiles ; thus obviating the burning difficulty and securing the advantages of sub irrigation at the same time.

This experiment yielded a few very plain facts and a great many more indications—enough to convince me that it was worthy of further trial—and if I were to build a set of houses I would either put in two sets of pipes, each so arranged that they could be run independent of the other but fed by the same boiler, or the same result may be accomplished as was done in the experiment upon carnations during the past season in the small propagating house of the University ; the part used is thirty-six feet long by eleven wide and was divided into two parts, each eighteen feet long; the benches are three and one-half feet wide and stand the same distance above the walk through the center; under the south, or outside, bench were three lines of one and one-fourth inch pipe and under the other bench, which is next to the other house, were two lines of the same size pipe; all pipes run the full length of the house, so that each part received the same amount of heat.

In house No. 1, all heat was confined under benches at all times except a few of the coldest nights, when it was necessary to let a part escape into the air in order to keep the frost out; the object being to warm the soil and keep the air temperature low as possible without burying the pipes in the soil, as in the Delaware experiment; in this way, a more evenly distributed heat was secured. This house was ventilated freely, and on several occasions the temperature went below 40 degrees; but so low a temperature is not advisable, as it bursts the calyx of the flowers of carnations.

In house No. 2, the pipes were not enclosed, but heat allowed to go into the air of the house, and ventilation was given only as absolutely necessary, in order to keep down the temperature on bright days. There were two hundred and ten plants, of standard varieties, in each house, and planting was made as nearly the same as possible; at no time during the experiment was water applied to the foliage of the plants of either house, the water being run in between the rows, under the supports. A small amount of carnation rust made its appearance in house No. 2, but no traces of disease were to be found in the house with the bottom heat.

The average temperatures and results from thirty-one obsertions, taken during January and February, are here given:

House No. 1—Air, 57⅓ degrees; soil, 63 degrees. Cut 395 flowers.
House No. 2—Air, 64⅙ degrees; soil, 58 degrees. Cut 256 flowers.

By this method of confining the heat under the benches no extra expense is incurred except for closing up the front underneath benches, and this may be done with the cheapest ceiling lumber.

In all, this has proven to be a valuable experiment and one of very great interest in heat application, more especially with regard to results than economy of heat, yet there is no doubt but that less heat is required where confined under benches.

As to the amount of water required in this experiment, no difference between the two houses was noticeable and might be calculated as being the same.

PROTECTION OF GLASS STRUCTURES TO SAVE HEAT.

During the autumn of 1894, when beginning work in Delaware, I was caught by a severe freeze before the heating pipes were in place, and in order to save the plants already started I used a covering of one inch boards laid upon the glass of one house. No temperature observations were taken ; but while ice almost one-half inch thick was formed outside, and lettuce plants in other houses were badly damaged, those in the covered house escaped unharmed by frost. This led me to consider the possibility of using profitably a covering material upon a large scale.

During the winter of '95 and '96, one house was covered on one side with boards for a few cold nights with a result of about nine degrees increase of temperature over a similar house alongside to which the same amount of heat was applied. Thus far, these experiments have been incomplete and insufficient to yield accurate results. In the European countries a covering is considered very necessary, and though straw mats are sometimes used, the most common covering is eight by one inch boards, long enough to reach from gutter to ridge, and are laid upon a stringer that is fastened on top of rafters, just below ventilators. This form of covering, while effective, can be used only where labor is very cheap, as the boards must be removed one by one each morning and replaced in the evening. Blankets, of one sort and another, have been tried with varying degrees of success, but were either too clumsy or expensive for practical use.

During the cold snap, from January 25 to 30 of the past winter, a very satisfactory and profitable experiment was carried out here at the University greenhouses. The propagating house, which is fifty-five feet long by eleven feet wide, was divided into three equal parts, with the same number and size of pipes running through all three parts, so that each received the same amount of heat. For the covering ordinary unbleached muslin was used, and in house No. 1 the cover was put on the inside, suspended about four inches below the glass, and so arranged upon wires that during the day it could be rolled up to the ridge and tied there. House No. 2 was covered by stretching the muslin upon the outside of glass and allowing it to rest upon glass. House No. 3 was left unprotected except the exposed end, which was covered with several thicknesses of blankets, in order that the conditions of each house might be the same.

The following temperatures were observed ;

Jan. 25. Covering put on, 8:00 P. M. Outside temperature, 4 below zero.
" 26. House No. 1, air 66½ degrees, glass heavily frosted.
" " 2, " 62 " no frost on glass.
" " 3, " 52 " glass frosted.
Jan. 26. 8:30 P. M. Outside temperature, 6 degrees above zero.
House No. 1, air 68 degrees, frosted.
" " 2, " 64 " no frost.
" " 3, " 54 " half frosted.
Jan. 27. 8:00 A. M. Outside temperature, 7 above zero, snowing.
House No. 1, air 74 degrees, snow not melting.
" " 2, " 70 " snow partly melting.
" " 3, " 61 " snow partly melting.
Jan. 27. 8:30 P. M. Temperature, 6 above, clear.
House No. 1, air 75 degrees, snow yet on glass.
" " 2, " 67 " no frost or snow.
" " 3, " 57 " snow yet half on.
Jan. 28. 8:00 A. M. Outside temperature, 5 below zero.
House No. 1, air 79 degrees, snow yet on glass.
" " 2, " 71 " no frost.
" " 3, " 62 " a little snow yet on.
Jan. 28. 8:30 P. M. Outside temperature, 2 above.
House No. 1, air 74 degrees.
" " 2, " 68 "
" " 3, " 60 "
Jan. 29. 8:00 A. M. Outside temperature, 14 above.
House No. 1, air 74 degrees, snow yet on glass.
" " 2, " 68 " no frost on glass.
" " 3, " 59 "
Jan. 29. 8:30 P. M. No observation.
Jan. 30. 8:00 A. M. Outside temperature, 6 above zero.
House No. 1, air 74 degrees, one-fourth heat shut off.
" " 2, " 75 " full heat.
" " 3, " 64 " full heat.

From these observations, it will be noted that the covering of house No. 1 did not hinder the frost forming on inside of glass and thus closing up openings, but prevented warmed air in the house coming in contact with the frosty glass and thereby being cooled.

The covering of house No. 2 prevented the cold air on outside coming in contact with glass, so that no frost was formed upon either side of glass ; this leaves all cracks or openings free for the passage of air and makes the house more open. The outside method was not found to be so convenient, as rain or snow makes the cover difficult to handle, and it must be securely fastened down to prevent the wind blowing it off or tearing the cover to pieces.

The difference, however, between houses one and two would be geater could full heat have been allowed all the time on No. 1 ; but part of the heat had to be shut off almost half of the time to prevent overheating the plants in the house.

This experiment has proved to be by far the most important in connection with heat application, and could be profitably employed in any greenhouse, whether a modern conservatory or a vegetable forcing house. The cost of putting in is not great, and would be lessened if houses were built to suit ; by using ordinary unbleached muslin and treating it with boiled oil and rosin to preserve it and supporting or rolling upon half inch gas pipe, a house 100 by 20 can be covered at a cost of about $12.50, or $6.50 per thousand feet of glass. Considering that it costs from twelve to fifteen dollars per thousand feet of glass to heat during a season, and as the case of house number one shows the covering will save about twenty-five per cent of the heat, at the very lowest calculation, it will be seen that the cover would actually pay for itself in less than two years, and this is not taking into account the labor saved in firing, although the labor might be balanced by that required in managing curtains ; a well arranged curtain that was well cared for—being taken off and stored away during summer—should last ten to twelve years.

From results of this experiment, I would be led to recommend the inside plan of using the cover and, by running heavy wires from the gutter to the ridge about six feet apart, the muslin may be fastened by one edge at top of house and allowed to rest upon the wires, or rolled up to ridge and tied there when not in use, as shown in Fig. III.

In conclusion, I wish to remark that the further I go into this subject of heat application to the growing of plants under glass the more evident its greatness becomes. Also, that the results herein given will, if properly applied, reduce the cost of production in this line.

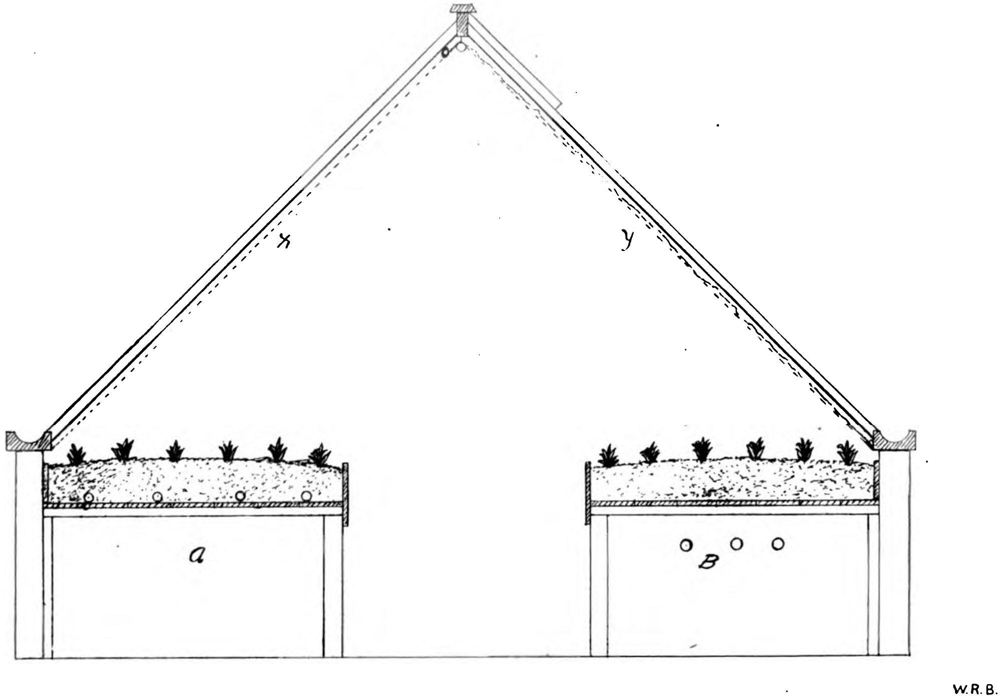


Plate III

Plate III. **Application of Heat to Soil.**—*A* Method used in first experiment. *B* Method used in later experiment. **Inside Method of Covering Glass to Protect from Cold.** *X* Showing position of wire and muslin when rolled up to ridge pole *Y* Muslin let down in place.

SOME GREENHOUSE PESTS.

BY JAMES S. HINE.

Assistant in Entomology, Ohio State University.

A study of insects observed injuring plants in Columbus greenhouses during the past two or three years, has been productive of results which I shall give to the members of the society at this time. In the following pages I shall discuss five or six species which I find to be more or less troublesome under glass and, with two exceptions, to outdoor gardens also.

Phlyctaenia ferrugalis Hbn.

Order LEPIDOPTERA ; Family PYRALIDAE.

This species is a serious pest in the greenhouses of Columbus, and, according to *Insect Life*, Vol. II, p. 277, one "which has long been known to feed upon greenhouse plants." Its life history was very carefully worked out in England by William Buckler and published by him in the *Entomologists Monthly Magazine* for 1878. At that time the larvæ were found feeding upon various weeds and one specimen was observed feeding upon strawberry leaves.

In the *Canadian Entomologist* for 1877, Grote describes *Botis harveyana*, which by later students has been considered synonymous with *P. ferrugalis*. Grote mentions that his specimens were procured in New York and Texas, but made no reference whatever to food habits of the larvæ.

The description referred to above is the earliest record I have seen of the occurrence of the moth in America ; but at the present time it has a wide distribution over Ohio and other states and has been reported at least as far west as Chicago. It doubtless belongs to the fauna of the whole of eastern United States.

In Bulletin 102 of the Michigan Experiment Station a new phase in the life history of *P. ferrugalis* is mentioned. Mr. G. C. Davis, the author, names the larva "the celery borer," and records observations upon it as a celery insect at Kalamazoo, Michigan.

During my acquaintance with the larva, I have never seen anything that would justify calling it a borer, but have found it to be an injurious celery insect, especially to the leaves of young plants before they are transplanted into permanent beds. They seem to thrive best in thick growing vegetation, where there is plenty of shade.

LIFE HISTORY.

The eggs of the species are placed singly on the under surface of the leaves of food plants. These eggs are light, almost white in color and are seen with difficulty on most plants. They hatch in about five days, producing larvæ 1½ mm. long, and milk white with a large, black head. The larva molts first in eight days and at intervals of about five days thereafter until it has molted four times. In eight days after the fourth molt it has become full grown and is ready to pass to the pupa stage. It now makes for itself a retreat by turning over the edge of a leaf—sometimes by drawing two leaves together—and fastening it securely with silk. Here it pupates at once and in the course of a week or so the moth makes its appearance.

DESCRIPTION.

The full grown larva is nearly an inch in length and its general color is light green, but there is a dark dorsal stripe, bounded on either side by light, which finally merges into pure white. Beyond the white there is an obscure, yellowish green lateral stripe. The head and thoracic shield are drab, with oftentimes a pinkish tinge. The latter has two black points placed well forward and at the sides. It is smaller towards each end, but more markedly so towards the head, and is sparcely clothed with long, pointed hairs.

The pupa is of the usual dark brown color so common to the pupæ of various insects.

Grote describe the moth as follows:

" A small species more slender than *communis*, with pale brown primaries, the exterior line fine, blackish, absolutely denticulate, rather suddenly drawn in at vein two, thence back again and angulate before the margin. Outer spot large, annulate. Inner spot obsolete. Before the fringes, which are faintly interlined with pale and are discolorous, there is a distinct sinus of dark points. Hind wings paler than the primaries, washed outwardly with the same brown as the primaries, with a distinct discal dot and median line. Beneath more ochreous, with the discal dots double on the hind wings; a common exterior line; on the primaries the veins are partially darker marked; terminal points very distinct and continuous. Head, palpi and thorax above pale brown, beneath concolorous, with the under surface of the wings glistening. Expanse 18 mm."

INJURY IN GREENHOUSES.

I have found that the time required for *P. ferrugalis* to pass through the different stages of its existence in the greenhouse requires about six weeks, so it is evident that at least five generations are produced in the interval between the middle of September and the middle of the following May, or the time during which most commercial greenhouses are in operation.

A few eggs or other stages, carried in on plants in the fall, are capable, under favorable circumstances, of increasing to vast numbers in five generations, and in consequence a great deal of injury is the result. This explains the condition of affairs in some Columbus greenhouses upon the appearance of spring.

The young larvæ begin feeding by eating small pits and furrows in the under side of the leaves. While doing this they simply cling to the leaf surface without any protection.

Larger larvæ protect themselves by drawing leaves together and fastening them with silk. In these retreats they either skeletonize or eat large holes in the foliage, greatly disfiguring its appearance, say nothing of the injury to the plants themselves.

Where this species gets established in greenhouses and becomes numerous it makes sad havoc among almost all kinds of plants. According to my observations, ageratums and heliotropes are preferably attacked, while geraniums, on account of the number grown, suffer most from its ravages. The larvæ have been found feeding upon chrysanthemums, begonias, abutilons, roses, pelargoniums, cinerarias, nasturtiums, moonvine, swinsonia, genista, and a number of other species and varieties.

REMEDIES.

On account of the comparatively small space enclosed, it is not nealy so difficult to control insects in the greenhouse as out of doors. But then the problem confronts us, how can we treat a dozen or more varieties of plants growing in close proximity, as they do in the greenhouse, and not injure the foliage of any of them.

Insect Life, Vol. II, p. 277, says: "In case these insects are not very abundant, handpicking will, of course, be the best remedy. If they should become very numerous an application of an arsenical solution may be made to the plants."

Handpicking larvæ is often quite tedious but usually proves to be a good remedy for practice in the greenhouse. The moths may be trapped at lanterns in the evening and a great many of them killed in this way, but the fact is many females have laid their eggs before they can be taken.

I have used Paris green, in the proportion of four ounces in fifty gallons of water, on geraniums, and find if the mixture is kept well stirred foliage is not injured by it. The most effective time to spray is while the larvæ are young and have not constructed their retreats. At this time, by spraying the under side of the leaves carefully, very good results may be obtained.

Heliothis armiger, Hbn.

Orrder LEPIDOPTERA ; Family NOCTUIDÆ.

The larvæ of this species has caused some annoyance during the past year by its appearance in great numbers upon plants in Columbus greenhouses.

They have injured geraniums, carnations and abutilons. The first named plants were injured most. The larvæ feed differently on geraniums than on corn, cotton and tomatoes, for instead of boring into some part of the plant they usually feed on the leaves. A few instances were observed, however, where the stem was bored, and oftentimes the blooms were attacked and badly disfigured. I saw an instance where young plants from cuttings were almost defoliated in a few days.

The larvæ injure carnations by boring into the buds and feeding upon the undeveloped flowers. Buds injured in this way soon turn brown.

In only a few instances did I observe specimens feeding upon the leaves of abutilons. It is evident that this is not a desirable food plant for the larvæ, but the species seems to be one that can become adapted to circumstances very easily. Specimens, as a rule, get into greenhouses by being carried in on plants, either in the egg or larva state. The fall brood of moths appear and lay their eggs on geraniums or other plants, near the time these are removed to winter quarters. The result is the eggs or very young larvæ go with the plants and pass their life cycle in the greenhouse.

The larvæ may be hand picked, or they may be controlled by spraying with the arsenical solutions.

Spilosoma virginica, Fabr.

Order LEPIDOPTERA ; Family ARCTÆIDÆ.

The larvæ of this species was taken on chrysanthemums. It has the peculiar habit of climbing to the top of the stem and eating the lower petals from the opening flowers. In this way it may cause serious damage. The leaves are oftentimes attacked also. The pest is all the more serious as it does a great deal of its work in the night, and remains in hiding during the day.

Handpicking seems to be the most practical remedy for this species.

Peridroma saucia, Hbn.

Order LEPIDOPTERA; Family NOCTUIDÆ.

The climbing cutworms are annoying in the greenhouse as well as in the orchard. The species in question, the variegated cutworm, is one which is able to procure food under varying conditions. At one time we find it in the orchard eating the leaves of fruit trees, at another feeding upon the foliage and stems of herbaceous plants in the greenhouse.

That which I desire to mention at this time is the habit which the larva has of injuring smilax. About the middle of last February the leaves of smilax in one of the city greenhouses were found to be seriously injured. The proprietor was at a loss to know the cause of injury for a time, but by observation, great numbers of larvæ were found under the chaff which had been used as a mulch for the plants. Soon these larvæ were associated with the injury, and it was found that they climbed the plants and ate preferably the younger leaves at the top

Like other cutworms, this species does its mischief in the night and remains concealed during the day. For this reason their injury is often a surprise to the gardener.

The species can be easily controlled by using Paris green in bran, mixed to the consistency of a stiff paste with sweetened water. The proportion of Paris green to bran is not important, but one ounce of the former to three pounds of the latter does the work. If this mixture is placed in small piles between the rows of smilax the larvæ eat it in preference to the foliage and are thus destroyed.

Orthesia insignis, Douglas.

Order HEMIPTERA; Family COCCIDÆ.

This species is one of the scale insects, but is peculiar in that, instead of secreting a scale which covers its whole body, secretes a scale in the form of a sack which is carried at the caudal end of the body. This sack receives and protects the eggs until they hatch, and for this reason Mr. Lounsbury refers to it as the marsupium.

In an exhaustive paper on the genus *Orthesia*, sent out by the Massachusetts Experiment Station a few years ago, the life history of *insignis* is carefully worked, and in the same paper is reported as having a wide distribution in the eastern states.

From its appearance and manner of attacking plants, one concludes at once that *O. insignis* is a near relative of the mealy bugs.

Sometime during the winter of 1895, Mr. Bogue, then a student at the University, brought in specimens of a scale insect which he found on coleus in a greenhouse in the city. He had some trouble in identifying the species, but finally associated it with *insignis*, which he found described and figured in Mr. Lounsbury's paper referred to above.

It was present the past winter in the same greenhouse on colias and acaranthus. I could not find it on any other plants, although I spent some time in trying to do so.

The young, at first, are much like young mealy bugs, but soon begin to secrete scales, and thus change their appearance, so that they may easily be identified. These young as soon as hatched distribute themselves over the plant, insert their beaks, and begin the work of destruction at once.

The most satisfactory remedy for this insect is fir tree oil. If this substance were not so expensive florists would find in it a very satisfactory remedy. Coal oil emulsion, when well made, gave fair results, but is not as effective as the first named substance.

Paradesmus dasys, Bollman.

Order DIPLOPODA ; Family POLYDESMIDÆ.

Not a great number of species of myriapods have been reported as injurious to cultivated plants. Dr. Fitch enumerates, among garden insects, what he calls the flattened centipede. Dr. Lintner reports instances where *Julus cæruleocinctus*, Wood, has been observed eating potato vines, and even burrowing into the seed tubes six inches below the surface of the ground ; and Professor Forbes has found *Cambala annulata*, Say, the strawbery centipede, feeding upon the strawberry plant in Illinois.

The species in question was described by Charles Harvey Bollman in 1887, from specimens collected in a hot house at Baltimore, Maryland, by Charles L. Edwards of Johns Hopkins University. Bollman's description, which was first published in Vol. X, Proc. U. S. Nat. Mus., is as follows :

DIAGNOSIS.

" Very similar to *Paradesmus gracilis*, but the tibiæ and tarsi of the male tuberculate beneath ; vertex pilose on each side of the sulcus, first and penultimate segments with two rows of setæ, rest with one ; copulation foot resembling that of *gracilis*.

Type—U. S. National Museum.

Habitat—Baltimore, Maryland.

This species is very closely related to *gracilis*, as shown by the character of the male genitalia, but is at once recognized by the character given in the diagnosis. The following differences were also observed, which, except the characters of male genitalia, are not of much importance: Dorsal plates somewhat wrinkled; repugnatorial pore (as compared with Soussure's figure of *P. coarctatus*=*P. gracilis*) not placed so far back nor the lateral carina so swollen; the end of the sheath inclosing the flagellum finely serrate as well as its branch; the other lobe widely 3 or 4 toothed; length of body, male 15.5 to 20 mm., female 17 to 22.5 mm."

I have not been able to find any published statement of the occurrence of the species in other localities, but as I have found it in all the Columbus greenhouses that I have visited, it probably has a wide distribution.

In Bulletin 46 of the U. S. Nat. Museum, page 187, the statement is made that the species is an introduced one and is found only in hothouses. When it was first introduced into this country, I am unable to say, but from its habits I think I am safe in saying that it was probably brought over with potted plants and transported from one part of the United States to another in the same way.

HABITS.

On the 10th of November, 1886, my attention was called to some fine varieties of *Adiantums*, which were reported to be receiving injury from some unknown source. It did not take very close observation to locate, what I supposed to be the cause of the injury, for one could see great numbers of millipedes, as well as smell their characteristic odor, as soon as one of the pots, in which the plants were growing, was lifted from its place.

I soon satisfied myself fully that the numerous specimens observed were the sole cause of the injury and went to work to find out something regarding their habits. I found that these millipedes, as other related forms, feed in the night, and conceal themselves during the day in moist places on the sides and beneath the pots. Their habit of feeding on *Adiantums* is peculiar, but one which is productive of the greatest injury possible; for they eat only the young, spiral-like fronds, the first night after they appear above the surface, consequently no new leaves are developed, and as the old ones soon fade, it is not long before the plants are rendered unsightly.

REMEDIES.

The remedies for myriapods in greenhouses are very simple, especially where plants are growing in pots. The pots may be moved and the pests killed with kerosene or hot water; then the pots may be replaced. It is well known that these animals collect under rubbish on the surface. Therefore, by placing short boards at various places over infested territory many specimens may be induced to collect under them, where they may be collected and killed.

In the case under consideration the pots were removed, the ballast in the benches was taken out, and the benches themselves thoroughly sprayed with kerosene and water in the proportion of one part of the former to four parts of the latter. Specimens that concealed themselves on the inside of the pots were killed by using kerosene emulsion of one-sixth strength. This was not put on the foliage, but only on the surface of the ground in the pots. This done, new ballast was furnished and the pots replaced. Not every one of the millipedes were killed by this operation, but they were so scarce after the treatment that no injury to the plants was perceptible. Only in extreme cases is it necessary to resort to such thorough treatment. At other times one of the simpler remedies mentioned above is effective.

Columbus, Sept. 28, 1897.

Columbus Horticultural Society.

QUARTERLY JOURNAL OF PROCEEDINGS.

VOL. XII. COLUMBUS, OHIO, DECEMBER, 1897. No. 4.

PROCEEDINGS OF THE SOCIETY.

OCTOBER.

Meeting called to order by the President.

John F. Cunningham and Professor Derby were elected to membership.

H. W. Phelps gave a short report upon vegetables. He advanced the idea that potatoes have a better flavor if left in the ground until cool weather.

Professor Lazenby observed 35 species of plants in bloom during the month.

Mr. Gill exhibited several specimens of Arkansas apples, as follows: Black Bendavis, Collin's red, called Champion by Stark Brothers, No. 83, named Apple of Congress by Stark Brothers, and Oliver red, which Stark Brothers call Senator.

J. J. Janney placed two apples on the table for name. They were probably Smith's cider.

Professor Lazenby gave notes on a display of 28 varieties of apples from western New York. He stated that he was experimenting upon their keeping qualities. The skin of some specimens had been punctured, and spores of the rot fungus introduced into some while others were punctured but not inoculated. The former began to decay first without exception.

The rainfall for October was .58 inch. Maximum temperature, 88.3° on the 16th; minimum, 28° on the 8th.

The discussion on "Shade and Ornamental Trees" was introduced by W. R. Lazenby. Afterwards Professor Kellerman, Mr. Gill, Mr. Burson and others took part.

There being no further business the Society adjourned.

NOVEMBER.

The meeting was called to order at two o'clock by the President.

Mr. Lageman announced that he had observed an extraordinary flow of gum from many species of trees this season.

Professor Kellicott had observed that the Aegerian maple borer is more destructive to maples in fields and ornamental grounds than in woodlands.

He reported that a flesh fly larva which had been coughed up by a boy had been brought to him.

The Franklin Park Floral Company kindly sent the following varieties of chrysanthemums for exhibition: President W. R. Smith, Indiana, Mrs. Perrin, Mary Wheeler, Violescent, Yonsma, Minnie Wannamaker, Mrs. Jerome Jones, Penn, Major Bonnaffon, Liberty and Golden Queen.

W. R. Beattie also presented several varieties of the same flowers, and gave some valuable cultural notes, and a list of 25 valuable varieties for general cultivation.

H. M. Sessions read a paper on the "Pingree Potato Patch Plan."

The Society then adjourned.

DECEMBER—ANNUAL MEETING.

The Society met in Botanical Hall December 18 at 2 o'clock P. M.

J. H. Lageman gave a report on Botany.

W. R. Lazenby reported on Meteorology.

W. R. Beattie mentioned a number of worthy flowering plants and exhibited a specimen of the double Gen. Grant geranium in bloom.

Dr. Aldrich was present and gave notes on new fruits.

J. H. Lageman read a paper on "The Origin of Christmas Decorations."

The subject of "Nut-bearing Trees and Their Products," was introduced by Mr. C. P. Fox. This was followed by an extended discussion in which nearly every one present took part.

The election resulted in the choice of the following:

OFFICERS.

President	W. R. Lazenby
Vice President	H. M. Sessions
Secretary	John F. Cunningham
Treasurer	Geo. W. Sinks
Executive Committee	O. W. Aldrich, D. S. Kellicott, J. J. Janney.

CHAIRMEN OF STANDING COMMITTEES.

Botany	L. H. McFadden
Vegetable Pathology	W. A. Kellerman
Entomology	D. S. Kellicott
Meteorology	W. R. Lazenby
Library	J. J. Janney
Fruits	O. W. Aldrich
Plants and Flowers	W. R. Beattie
Vegetables	Thos. F. Hunt

As the Treasurer's report was not ready for this meeting the Society ordered that it be published in full in the forthcoming Journal.

The Society then adjourned.

JAMES S. HINE, *Secretary.*

REPORT OF THE TREASURER.

Geo. W. Sinks, Treas., in account with the Columbus Horticultural Society.

Receipts.

1896.		
Dec. 29.	To balance	$293 49
Dec. 30.	To interest on $500 City bonds	15 00
1897.		
Feb'y 1.	To interest on $5,000 C. & T. R. R. bonds	175 00
July 1.	To City bonds paid	400 00
July 1.	To interest on bonds	15 00
Aug. 2.	To interest on $5,000 C. & T. R. R. bonds	175 00
Oct. 6.	To interest on City bond	1 25
Oct. 6.	To City bond paid	100 00
		$1,174 74
1897.		
Dec. 31.	To balance	$350 95

Expenditures.

1897.		
Jan. 15.	By Terry Engraving Co., bill	$ 2 22
Jan. 15.	By J. S. Hine, sundry items	26 77
Apr. 27.	By Spahr & Glenn, bill	157 00
Apr. 28.	By Terry Engraving Co., bill	6 00
Apr. 30.	By J. L. Trauger, bill	15 95
May 26.	By Subscription, Garden and Fruit	4 00
July 1.	By City 4 per cent. bonds at par	500 00
Oct. 9.	By J. S. Hine, bill	38 60
Oct. 11.	By Spahr & Glenn, bill	54 75
Dec. 16.	By Terry Engraving Co., bill	6 00
June 4.	By J. S. Hine, bill	12 50
	Balance	350 95
		$1,174 74

Investments.

Columbus & Toledo R. R. first mortgage 7 per cent. bonds	$5,000 00
City of Columbus 4 per cent. bond	500 00
Total	$5,500 00

Respectfully submitted,

Geo. W. Sinks, *Treasurer.*

COMMUNICATIONS AND DISCUSSIONS.

THE PHYSICAL PROPERTIES OF NUTS.

BY CHARLES P. FOX.

Christmas time brings feasts of candy and nuts. With the exception of the peanut, nuts are not used in this country to any great extent at other seasons of the year. Their use as a dessert fruit is limited, and they are considered more in the nature of a luxury than a necessity.

The great interest manifested in food reform will soon result in a general use of a balanced ration for the human stomach. These changes in our present methods of feeding may lead to the use of more nuts, especially where a vegetable diet is desired. The majority of our vegetable foods are deficient in fat. Nuts excel in fat. The kernel of the black walnut contains 49 percent, the butternut 61 percent and the American chestnut 17 percent. From these figures it will be seen that a few ounces of kernels will supply the requisite amount of fat required by the daily ration.

Concerning the chemical composition of nuts I will speak at another time. At present I will deal with the physical features or characters of some of our common nuts. The term nut is used in its commercial sense rather than the botanical. The list therefore includes all of the so called nuts excepting the cocoanut, beechnut and pinenut. The cocoanut is used more for the purpose of confection than for eating from the hand. The beech and hazelnut could not be obtained and the pine is found only on western markets.

By means of these diagrams and figures the differences between the nuts may be readily seen. It might be interesting to add that these figures are the results of some tests made in the Horticultural Laboratory of the University by the class in Pomology under Prof. Lazenby.

The first table shows the number of nuts in a pound of the various kinds. The largest numbers are found with the peanut, filbert and American chestnut. The smallest numbers are represented by the walnuts, large hickorynuts and foreign chestnuts. Attention is called to the wide difference between the large hickory and the shell-bark. There are nearly four times as many of the latter as of the former in a pound. There is also quite a difference between the types of the large hickorynuts ;

the large flat nut, "type A," run only 39 to a pound, while "type B" contains 54. The percentage of shell in the two varieties is the same.

Table No. 1.

NUTS—Number in one pound.

Walnut	36
English Walnut	54
Brazil Nut	56
Shell Bark	179
Spanish Chestnut	37
American Chestnut	230
Almond	83
Filbert	222
Peanut	222
Pecan	100
Butternut	41
Large Hickory	39
Large Hickory	54

Table No. 2.

NUTS—Percentage of Kernel.

	Per cent.
Walnut	24
Butter Nut	20.6
English Walnut	42
Shellbark	32
Brazil Nut	41
Almond	27.5
Spanish Chestnut	87.5
American Chestnut	75
Filbert	45
Pecan	49
Peanut	72
Large Hickory	20

Table No. 3.

NUTS—Amount bought for five cents.

NAME OF NUT.	Value per pound.	Weight that can be purchased for five cents.	Per cent of whole nut that is kernel.	Weight of Kernel.
Pecan	6 cts.	13.3 oz.	49	6.5 oz.
English Walnut	12 "	6.7 "	42	2.8 "
Filbert	10 "	8 "	45	3.6 "
Almond	12 "	6.7 "	27.5	1.8 "
Peanut	5½ "	14.5 "	72	10.4 "
Spanish Chestnut	15 "	5.3 "	87.5	4.6 "
American Chestnut	15 "	5.3 "	75	4 "
Brazil Nut	15 "	5.3 "	41	2.7 "
Shellbark Hickory	2 "	40 "	32	12.8 "
Large Hickory	2 "	40 "	20	8 "
Walnut	1 "	80 "	24	19.2 "
Butter Nut	1 "	80 "	20.6	16.5 "

Table No. 2 is designed to show the percentage of kernel. The highest is 87 percent in the Spanish chestnut. The second highest is 75 percent in the American chestnut. This is followed closely by the peanut containing 72 percent.

The lowest percentage is found in the large hickorynut (20 percent). The butternut and black walnut are also low. In comparing the Maderia nut (English walnut) with the butternut and walnut we find that it has about twice as much kernel. The two varieties of chestnut well illustrates the influence of cultivation and selection in improving our fruits. There is only a difference of 25 percent between the two kinds, but this is enough to make the ratio of shell to kernel 1 to 3 in one case and 1 to 6 in the other, or in other words the shell of the Spanish chestnut has been reduced one-half.

From the comparative size of the two nuts one would think that there would be a greater difference in the weights of the kernels. Examination shows that the kernel of the large chestnut is not compact and solid like that of the small variety.

The sample of Brazil nut examined was very poor. The percentage of kernel is between 40 and 50.

Table No. 3 shows the financial side of the question. The small boy with a burning nickle in his pocket and an unsatisfied appetite for nuts will find this table of great value. The prices are recent market quotations. If we lay aside the peculiarities of individual taste and consider the matter from a true financial basis we find that shellbark hickorynuts at two cents a pound and walnuts at one cent a pound are the cheapest. Of the true commercial nuts the peanut at five and one-half cents a pound is the most economical. Compare this nut with the pecan. The pecan sells for a half cent more per pound. The total bulk received for five cents is about the same in each case, but the actual value received is more than one-third in favor of the peanut. The most expensive nut is the almond at twelve cents a pound.

The two varieties of chestnut and Brazil nut furnish a good example of the point at issue. Each of these nuts sell for fifteen cents a pound. The chestnuts are superior by at least one-third.

The selling price also makes the English walnut comparable with the almond. In this case there is a difference of about one-third in favor of the English walnut.

In the course of the investigation it was found that in cracking the larger nuts there is a "milling" or cracking loss of about four percent; about one-half of which is kernel.

Another fact brought out is that the pecan is painted and polished before being sent to market. This adds much to the appearance.

Other work in progress is the determination of the specific gravity. The true weight of a definite volume will also be determined with the aim of establishing a legal weight.

A chemical study concerning the food value of nuts is under way and the results will be presented in another paper.

WHERE TO PLANT NUT TREES.

BY WILLIAM R. LAZENBY.

It seems to me that our 'nut trees' might often be planted along roadsides, lanes, fence rows and odd corners of the farm. Upon almost every farm there is more or less waste land which often is well adapted to certain varieties of nut trees. Among the varieties which can be used for this purpose in the state of Ohio may be mentioned the black walnut, the butternut, the American chestnut, the shagbark hickory, and in the southern part of the state, the pecan. The hazel nut may be included in the above list also.

The black walnut and the butternut may be grown in almost any deep, rich, moist soil. They each have quite a wide range and thrive in almost any good soil that is not too dry. The walnut is more common in the south and west, the butternut in the north and east. The chestnut has a somewhat narrower range, but succeeds well on sandstone ridges and in soils that contain little or no lime.

The chestnut varies greatly in the size and quality of its fruit and the best nuts from the most productive trees should always be selected for planting. The Spanish, Italian and Japanese chestnutfs may be grafted upon our native stock with good success.

The shag- or shellbark hickory is less particular in its soil requirements than the nut trees already mentioned. It is found on sandy ridges, clay hillsides and rich lowlands. It is a tree that delights in a shade of underbrush, but grows well in open groves. The nuts from this tree are extremely variable in size and quality. Only the large, thin shelled, sweet kerneled varieties should be selected for planting. The pecan is a southwestern species. Its eastern limit is central Kentucky, and northern limit a little north of the Ohio river. It is believed by some that it may be successfully cultivated wherever the peach is grown. We know that in some sheltered areas it has been successfully grown much farther north than its native habitat.

As a rule, the nut trees are best grown by planting sprouted nuts where the trees are to stand. They will require some nursing and protection for the first few years, but will soon take care of themselves. It should never be forgotten, if we are after fruit rather than timber, that our nut trees should be encouraged to branch low and form wide-spreading, open heads, admitting light freely. For timber we should plant closely so as to form a tall, straight trunk. There may be no great promise of profit in nut culture, yet I am certain that a little well-directed labor in this direction can scarcely fail to return equal pleasure and satisfaction.

THE ORIGIN OF CHRISTMAS DECORATIONS.

BY J. H. LAGEMAN.

Celebrating Christmas is as old as Christendom, but celebrating Christmas with decorations in green wreaths and especially in putting up the well known Christmas tree, as is done now over the whole world, is not so old as many of us may think it to be. Even here in our United States the Christmas tree was hardly known one hundred years ago—yes it was rarely seen fifty years ago, although the German pioneers used to put up a Christmas tree wherever they went over the world, and while their neighbors, unused to this celebration for the children, in the beginning stood somewhat surprised at such a queer notion, they soon followed and initiated it as just the thing they liked for their children and the whole family. There is now not a fashion so generally adopted as the celebrated Christmas tree with its glittering golden nuts, red cheeked apples, paper cornets filled with candies and dainty things shining among a mass of colored wax candles glaring in beautiful lights, and below the tree precious presents placed in graceful groups for all members of the family, but especially for the little ones of the family and neighbors sometimes included.

Where did the Christmas tree come from ? Was it perhaps an old relic of the church ? No, the church takes no part in it. She has her own decorations for Christmas and this is the crib ornamented with the Holy Infant, on his side the blessed mother, the pious and humble foster-father, shepherds in their country attire, angels high above, and in the corner of the ideal stable the meek ox and donkey ; all decorated in green and beaming in lighted candles. (If any one of you never saw such a crib-representation at Christmas, then he may go and see it in one of the Catholic churches of this city and elsewhere. And if you ask me when and where this crib-representation did start at first, I will say, that according to the legend, St. Luke painted the first picture of the holy mother with her God-infant, as the pictures were later found somewhat similiar in the catacombs in Rome, and from this picture to a decorated crib with statuary adornments was only a step, made probably at first by St. Francis de Assisi about the year 1200.)

But let me return to the history of the Christmas tree. In our almanac we find for every day a name or names of saints, and on the 24th of December we find the name of Adam and Eve. These two names remind us of the forbidden tree in the Garden of Eden and the legend says, that Adam leaving the Garden of Eden brought a twig of said tree upon the earth and planted it, which grew and became afterwards the wood for the Holy Cross of our Savior, and as our Savior was called a "Twig from the Root of Jesse," so we can easily form an ideal connection of our present Christmas tree with the forbidden tree of Eden. Let our Jewish brethren have their right for Christmas, too, when they say the Christmas tree is a remodeled seven-armed chandelier of their temple. Good. Let the chandelier of the Old Testament contribute his foreshadowing light to brighten up the Christmas tree of the New Testament!

Let us go on with our further investigation. For some people our Christmas tree has nothing particular. It is to them nothing but a reminder of the old heathen Yule-log. But an old burning log is as far from a nicely decorated Christmas tree as the Yule-log country is from the original Christmas tree country. So, then, you may say, there are many festival trees—the Liberty tree, the Campaign tree of this country, the May trees, Pentecost trees and Harvest trees of Germany, etc. But, my dear friend, that tree raising is always on public streets and places outside, while the festival Christmas tree is only inside, in the heart of the family. Every year there are brought from far and near whole car loads of holly, pine and cedar, box and other evergreen trees to be sold for Christmas trees. Are they always taken by law-abiding action? No, we read here in the United States several times of bitter complaints that such trees had been stolen by the hundreds and thousands. If this had been done in former times, we would surely find some regulations and laws in historical acts, but Alexander Tille in Glasgow informs us that there could not be found anything of that matter after he had made a careful research. Dr. Distel in Dresden, Saxony, hunted also carefully in all the forestry acts of the imperial archives of Saxony for regulations concerning the cutting of Christmas trees, but nothing was found.

So we see, the Christmas tree must not be so very old. Although a legend says Martin Luther (1538) had brought one evening a cedar tree with glaring candles into his room to celebrate Christmas, this is nowhere in his nor in his friends' writing about him to be found, and this insinuation is entirely groundless, as during a whole century after him we do not hear anything of a Christmas tree.

Some years ago Dr. Distel, in his searching after the historical facts about the origin of the Christmas tree, discovered in Strassburg an old German book with a Latin title A. D. 1605, in which he found the first account of the Christmas tree with these words: "Auf Weihnachten errichtet man dann Baume zu Strassburg in den Stuben auf, henkt Rosen aus vielfarbigem Papier geschitten, Aepfel, Oblaten, Zischgold, Zucker, etc." This means: On Christmas they put up trees at Strassburg in the rooms, hang on roses made out of many colored papers, apples, wafers, tinsel, candy, etc. And it looks as if the Christmas tree celebration at that time was a generally well known one. Then we find in a book called "Catechism-Milk," edited in Strassburg, 1642–46, that a theologian named Dannhauer makes a hard attack against the fripperies of Christmas tree celebration.

The next mention of the Christmas tree is made in 1737 in a "Juristical-Thesis" at the University of Wittenberg. The celebrated German poet, Wolfg von Goethe mentions, the Christmas tree in his book, "Passions of Young Werther," Die Lieder des jungen Werther, in 1774, and Friedr. von Schiller, his intimate friend, knew it very well, too. Since 1807 the Christmas tree commenced to appear regularly in the Christmas market and from that time it has gone in great strides all over the world, so that it is now put up at Christmas time at the North Pole, among the ice-beleaguered Arctic explorers, as well as on the ocean steamers and sailing vessels by sailors that could not be present at the Christmas festival on terra firma, as likewise in all habitable countries on God's earth from north to south, from east to west, uniting all people to one great Christian family.

THE PINGREE POTATO PATCH PLAN.

THE FOUR P. P. P. P.

THAT MEANS NO POVERTY, BUT PEACE, PLENTY, AND PROSPERITY.

BY H. M. SESSIONS.

The Pingree Potato Patch Plan was a plan adopted in Detroit by Mayor Pingree, for helping the unemployed to support their families without applying to the Board of Charities for help. This was first called to my attention in the fall of 1894, when the report of the experiment of the mayor, in this line, was given to the people of this country through the press.

This first experiment was a remarkable success, and it has been a much greater success each year of its four years trial. Will give the statistics further on.

THE HAIG MISSION.

In the winter of 1894-5 I was connected with Mr. Haig in his mission work, searching out frauds, and dead beats; often consulting the charity, medical and police departments of the city, and visiting the families of those receiving work and aid from the industrial Mission on South Seventh Street; especially those families who had children, getting their confidence and giving them council and sympathy. Hundreds of families were on their list of patrons, both for labor and for receiving aid, and as charity by those unable to labor. Most of the families were very unwilling to be classed as paupers, and would deprive themselves of all the luxuries, and most of the necessaries of life, rather than to receive the title of "Town's Poor," or "Paupers." Give me work! was their cry. Its all I ask, and I can take care of my own family. One man said he wouldn't work for fifty cents a day, or five cents an hour; he would starve first! But a few words of explanation convinced the man that fifty cents per day and dinner would go as far, for food and clothing for his family, purchased at the mission rooms, as one dollar per day spent at the retail stores of the city. The next day he was at work again cutting kindling at the mission, or knocking abandoned cars to pieces for the wood. This family consisted of himself and son, both married, and with young children, occupying two rooms, in which the women were at the wash tubs, at work supporting their families. The men that day were at home idle, but were at work the next day.

One applicant for help was a young girl 12 or 14 years of age, with a shawl over her head, giving her name, street and number ; said her father was dead, her mother sick in bed, and no food in the house for two days ; wanted food immediately. We went to her alleged home, and if all was true we were to telephone to the mission and food would be sent at once for their relief. But her street and number was a palatial residence, and no such family was there ; with the help of the truant officer, to whom the case was referred, her home was found ; her father was alive and her mother well. They were Italians and were living in idleness on the collections the girl received from several church and society charity stations in different parts of the city.

The Industrial Department of the mission is increasing in importance each year. Three years ago the kindling business outgrew the room it occupied. The Hocking Valley Railroad Co. gave the wood work of their abandoned coal cars to the mission, reserving the iron, if they would knock them to pieces. A shed was built (over a side track), 100 feet long and 40 feet wide, where a gang of men, out of employment, have been cutting the wood into kindling ; 751 of these cars have been demolished in three years. Last year the contract for kindling furnished the city school houses, at $1.40 per load, amounted to $462. Brooms and kindling also are sold all over the city. The report for the year ending September, 1897, will show that the donations received for the year amount to $4,103.25 ; earnings from labor, $4,220.92 ; given away, $15,372.83. The labor account for the year amounts to 20,459 days labor. For every dollar received as donation, $3.75 have been given away.

REMEDY FOR POVERTY.

The best way to cure any sickness or disease, or remedy any great evil in the land, is to remove the cause. I found in visiting the families who depended on charity for support, and there were hundreds of them, that most of them were the victims of their own perverted and uncontrolable appetite for strong drink ; and the poverty and destitution was mostly caused, either directly or indirectly, by intemperate habits. Therefore we say, *Abolish the Liquor Traffic !* and nine-tenths of the poverty, crime and expense of the city, state and nation would be removed. A man adicted to the use of intoxicating drinks unfits himself for any responsible position, and is soon discharged, and in idleness. Our railroads understand this, and run no risks on the property and lives of their patrons, and require strictly temperate habits of all their employes.

Our life insurance companies also discriminate against habitual drinkers, and take no risk on their lives. If the twelve hundred million dollars now spent annually in the liquor traffic—wasted, and worse than wasted, for strong drink—were turned into legitimate trade and business, 75 per cent of the idleness, poverty and crime of our land would be removed. I hope this matter will be settled quietly at the ballot box, but I am afraid rum will fight. Many say that public sentiment is not ready for it, as yet, too few are voting that way. To such I ask, What progress would the religion of Christ have made after His death if the Apostles had adopted that plan? There's too few of us to accomplish any good? No, my friends, that is not the material of which martyrs are made. Therefore we say our nation cannot afford to allow the liquor traffic to exist; nor can the nation long exist, half *drunk* and half *sober*, any more than it could in the sixties remain half *slave* andhalf *free*. But it can afford to buy out the whole business, every distillery, brewery and saloon in the land, rather than to allow it to exist another year to ruin the nation. The amount saved the nation by the abolition of the liquor traffic would soon pay the bill. A word to the wise is sufficient.

THE HAIG PLAN.

Later in the spring of 1895 Mr. Haig suggested that we adopt the plan of gardening on the vacant lots of the city. The plan was to utilize the cheap labor of the mission to raise a crop of potatoes and store them for the next winter's use, to be distributed from the mission's store to families as required. I spent some time in canvassing the city for suitable lots, mostly in the east or southeast part of the city, where they would be handy to the Seventh Street mission, the headquarters of the Industrial Department. The objection to many of the lots offered were, first, the surface had been all taken off years ago and burned into brick with which to build the city and pave the streets. Nothing was left but a barren hard clay sub-soil to work upon. Only by plowing in the fall for the frost to work upon, and applying a large quantity of manure, could much of a crop be raised. Other lots were covered with gravel hardning and cobble stones, removed from streets to prepare them for the laying of asphalt, and others had been the dumping ground for city trash and street sweepings for years, consisting of a conglomerate mass of broken glass and crockery, tin cans, stove pipes and brick bats, with abandoned hoop skirts and old boots and shoes. To prepare such ground for a crop would cost more than it would bring in market the first season; but when once subdued and reclaimed, would be invaluable for the production of garden crop in the future. Some real estate men objected to having gardens on land under their care, from the supposed objection their customers would make when shown a lot where garden crops and potatoes were growing. They would say, "Oh, I want to buy a lot in the city and not out in the country." When to a man of taste it would look much more attractive and desirable than a lot covered with burdock and cockleburr weeds six feet high.

In June Mr. Jacobs, of The Kilbournc & Jacobs Co., offered us 40 acres, if we could use as much, on the rich black bottom land soil north of their tool shops, east of the North Fourth Street car line, and between Fifth and Eighth Avenues. Twenty average sized building lots, or two acres, were used. The first acre was plowed and harrowed the 13th of June and planted the next day. There was no rain scarcely to lay the dust from the time they were planted to the time they were dug, the last of August. There was a poor stand, many not coming up. The second acre was planted a week later. They never came up at all, the seed drying in the ground like dryed prunes, both the cut and uncut seed. Both acres were sowed with turnips the middle of July but the ground was too dry for even turnip seed to germinate. We hired the plowing and harrowing done. The planting, hoeing and harvesting was by the laborers of the mission. Lack of rain was the cause of the failure. We had good soil and good seed; it was well plowed, well planted, and cultivated. The unprecedented drouth was the only cause of the failure to produce a crop. The lack of funds prevented the repetition of this plan the next year.

CITY PETITIONED TO ADOPT THE PLAN.

The next spring, 1896, the matter was put into the hands of Mayor Allen, with the reports of the work in Detroit, and the request that it be managed by some department of the city government. He reported that the Council decided that it was too late to begin that spring. The next fall, which was a year ago, the request was made again, with more of Mayor Pingree's report of the success in Detroit, but nothing was ever heard from it.

Early in October of this year, 1897, we placed the matter in the hands of Mayor Black, with the Detroit reports for 1895 and 1896, and a request that a committee of citizens be appointed to investigate the matter, and if considered feasible, to inaugurate such a plan of operation as they deem best adapted to warrant its success in Columbus.

The lack of funds for the city poor department at the present time, and the prospect that a large amount of money will soon be needed to meet the pressing demands, it would be a great relief if we had the assurance that a thousand or more families were fully provided for, from the product of their potato patch gardens, if they had only been under cultivation the past season. For this reason it would be wise for the city to begin now, and adopt a plan to be carried out next season, so that it will help the people to help themselves; and next fall the city will be better prepared to relieve the wants of the needy.

THE DETROIT PLAN.

In the spring of 1894 Mayor Pingree was the first in this country to adopt the plan for helping the poor to help themselves, by cultivating vacant lots in the city and thereby relieve the tax burdened community; but he probably knew that a similar plan had been in use for a long term of years in Berlin and other foreign cities. The funds for this first year were raised after much effort by subscription. It was found that more than half of the money was contributed by the city employes. The aid of the poor commission was secured to determine who should receive help, and only those most needy and deserving were assisted; $3,618 were raised and expended.

In 1895, of the 1,546 persons chosen, 1,258 had been on the books of the city poor commission; $5,000 were appropriated by the city, and $4,000 in 1896. The surplus remaining from these two last appropriations was all that was used in 1897, with a balance of $272 remaining; some few subscriptions being added to the funds each year.

In 1894, as stated above, $3,618 were raised and expended. Value of crop, $1,400; per cent of profit, 280; number of acres, 430; number of families helped, 975; net profit, $4,352.

In 1895, amount expended, $4,875 (the cents being omitted in each item); value of crop, $27,792; per cent of profit, 468; acres cultivated, 455; number of families helped, 1,546; net profit, $22,916.

In 1896, expended $2,400; value of crop, $30,998; per cent profit, 1190; number of acres cultivated, 221; number of families helped, 1,701; net profit, $28,598.

In 1897, amount left over and subscriptions added, $1,993; expended in 1897, $1,749; number of bushels raised, 53,415;

value of crop raised $37,390; per cent profit, 2,059; net profit, $35,397; number of families helped, 1,563; cost per family, $1.10. This table shows that the per cent of profit ranged from 280 in 1894, to 2,052 per cent in 1897. The potatoes were valued this year, 1897, at 70 cents per bushel. The net profit items in these statistics will show the profits to the city for the reduction of taxes.

In 1896 the agricultural committee consisted of Mayor Pingree, President; Capt. Conline, U. S. Army, Treasurer, in charge; and John McGregor, Jr., Secretary. They received the advice and assistance of Capt. C. Gardner, of the 19th U. S. Infantry, during the early part of the season. Their personal services were gratuitous. Contracts for plowing and harrowing were let at $2.25 per acre. Seed potatoes at 20 cents per bushel, to be delivered in the city, when and where desired, without additional cost; ¼ acre lots were staked off and two bushels of seed potatoes for each lot were delivered.

To give an idea of the extent of the work in visiting the 1,565 family lots this year, 1897, as they were scattered over an aera of 5 by 8½ miles, and to visit all the sections in succession, required a journey of over 30 miles.

Mayor Pingree said in his report to common council: "It seems to me that the experiment has already demonstrated: 1. That at least 95 per cent of the people who are in destitute circumstances as a result of hard times are ready, willing and anxious to work. 2. That a large number of these people can be supported by utilizing vacant land in the outskirts of the city. 3. That a very small space of ground is sufficient to raise enough vegetables to support a family through the winter. 4. That a majority of our citizens who own vacant land would much rather allow it to be cultivated by the poor than pay a large tax for their support. 5. That the needy are thereby assisted without creating the demoralization in the habits of the people that gratuitous aid always entails."

FROM THE AGRICULTURAL COMMITTEE REPORT FOR 1896.

Two mounted patrolmen, one on the east and the other on the west side, visited the farms daily during the season, reporting anything that required attention, and the police in general were directed to protect the farms as much as possible within their jurisdiction, when not inconsistent with their other duties.

The care bestowed by the individual owners upon their lots, was in general, excellent; only a very few were delinquent, and to those postal cards were sent directing them to take proper care of their lots.

As a purely business transaction, the "Pingree Potato Patch Plan" is, to say the least, a very decided success.

No other plan of helping worthy people to help themselves, has attracted such wide-spread and universal attention in the English speaking world, certainly not in the United States, within the memory of most of those now living. Of the thousands of newspapers and periodicals of the best class in our country, a large number have given the Detroit Plan a more or less extended notice, and in general the highest commendation.

Very many of the great cities of the Union have adopted the plan and carried it out with success.

Other objects are unconsciously attained. It creates a desire on the part of those receiving assistance, to have land of their own if possible; it is also an object lesson in industry and thrift that will not be lost on the children who go out with their parents to assist in planting and harvesting the crops; from the pretty babies in their buggies who incidentally get an outing, to the interesting children of seven or more years of age, who act as interpreters for their parents who cannot speak the language of the country—in this most beautiful picture, all seem happy, contented and grateful for the kindness of Providence, and their fellow beings. No matter how prosperous the country may be in the future, there will always be those who require assistance, and it would be the part of wisdom and economy to make provision in advance. Persistent and painstaking effort was required to get the necessary land this year, involving loss of valuable time in planting season, to say nothing of other incidental obstacles encountered.

It is therefore recommended that the city purchase, if practicable, 200 or more acres of land on either side of Woodward avenue, to be used as farms, fenced and provided with inexpensive store houses for tools, seeds, etc., with an intelligent overseer or superintendent for each division.

In short, have the Pingree Detroit Plan so systematically arranged in advance in all its details, that work which is now spread over six weeks, can be concentrated into one week or less time, and the entire issue of lots and seed confined to a single day.

These farms can, as the city becomes larger, be converted into parks.

From the foregoing facts it will be seen that the report of the success of the four years trials of the "Pingree Potato Patch Plan" in Detroit, has shown to the people of this country that it is worthy to be adopted by all of our large towns and cities.

Since writing the above Mayor Black appointed a committee of three who have adopted the Detroit plan, and have the general direction of its operation in Columbus the coming year.

May their efforts be rewarded with as great success as has been rewarded in Detroit to the "Pingree Potato Patch Plan."

OHIO BUTTERFLIES.

BY JAMES S. HINE.

Among the diurnal Lepidoptera or butterflies there are several species whose larvæ are injurious to some cultivated plant or plants. If one should attempt to estimate the loss occasioned in Ohio by the larvæ of the imported cabbage butterfly alone he would find that several thousands of dollars are involved. Besides several common species feed upon clover, one at least upon celery and a number upon the foliage of our common shade and ornamental trees. Thus this subject might, perhaps with profit, be treated from an economic standpoint. But having a desire to know more about the distribution of butterflies in Ohio and the species inhabiting it, I give in the following pages a list of all the species known to have been collected within our state, together with notes on literature, distribution and food habits of some of the larvæ. Hoping it may aid some in making observations, and induce them to report such species as are new to the state, together with various other notes of interest.

In the preparation of this list I have been aided by Dr. Kellicott, Dr. Dury of Cincinnati, Dr. Claypole of Akron, Prof. Lynds Jones of Oberlin and Prof. Webster of the Ohio Experiment Station.

LITERATURE.

The following works have been freely consulted in my study of Ohio butterflies:

1. Blatchley, W. S.—A Catalogue of the Butterflies known to occur in Indiana.
2. Edwards, W. H.—Butterflies of North America, Volumes I and II.
3. Fernald, C. H.—The Butterflies of Maine.

4. French, G. H.—The Butterflies of Eastern United States.
5. Harris, T. W.—Insects Injurious to Vegetation—Flint's ed.
6. Morris, J. G.—Synopsis of the Described Lepidoptera of North America.
7. Scudder, S. H.—Brief Guide to the Commoner Butterflies of the Northern United States and Canada.

Blatchley gives a bibliograhy of the Indiana species, together with notes on distribution, dates of capture, immature stages and food plants. His work is to be found in the 17th Report of the State Geologist of Indiana for 1892.

Edwards describes all the stages and figures in colors many of the butterflies indigenous to North America. This is an elaborate work, but a good one. The three volumes may be procured of Houghton, Mifflin and Company of Boston or New York.

French gives a key to the adult forms of all butterflies known to have been collected in eastern United States. He also gives a chapter on anatomy and devotes over 300 pages to descriptions of adults, pupæ, and larvæ, and notes on habits and food plants. J. B. Lippincott and Company, of Philadelphia, have this work for sale.

Harris gives a technical description of 54 species of butterflies from the eastern states. The work may be procured of the Orange Judd Company of New York.

Fernald gives an artificial key to the species of Maine butterflies. Descriptions of the various stages, and notes on food plants of 69 species are to be found in this work also. Special attention is given to injurious species in several cases. The Butterflies of Maine may be procured of the author, Agricultural College, Amherst, Mass.

Morris gives a synopsis of Diurnal and Crepuscular Lepidoptera. Published by the Smithsonian Institution in 1862.

Scudder gives artificial keys based on the butterfly, on the pupa and on the larva. Also a chapter on collecting, preserving and studying butterflies, and over a hundred pages are devoted to descriptions. This work is published by Henry Holt and Company of New York.

A very useful paper is W. H. Edwards' Revised Catalogue of the Diurnal Lepidoptera of America north of Mexico, published in the Transactions of the American Entomological Society, Volume XI, 1884. This paper contains the synonymy and references to literature for every species of American butterfly taken north of the Mexican boundary up to the time of publication.

NYMPHALIDÆ.

1. *Danais archippus*, Fab. Blatchley, 376; Fernald, 34; French, 144; Harris, 280.

Anosia plexippus, Scudder, 63.

The monarch, or milkweed butterfly is a common species all over Ohio, appearing on the wing at the beginning of summer and remaining until autumn. The species hibernates in the adult state. The eggs are laid singly upon various species of milkweed, *Asclepias*, where the larvæ feed until full grown. The shining green pupa of this species is very often seen fastened to buildings and fences. The adults are usually common in fields of red clover that are in bloom about the first of September. They have an odor which protects them against the ravages of insectivorous birds.

2. *Euptoieta claudia*, Cram. Blatchley, 380; Fernald, 42; French, 165; Scudder, 81.

Argynnis columbina, Morris, 44.

The claudia butterfly, or variegated fritillary, has a wide distribution in Ohio. In central Ohio it seems to be most abundant about the first of October. It was abundant at Georgesville in October, 1896.

The larvæ feed upon violets, mandrake, purslane, passion-flower and a variety of other plants.

3. *Argynnis diana*, Cram. Blatchley, 377; Edwards, I, 63, pl. 20; II, 148, pl. 29; French, 153; Morris, 42.

The diana butterfly is not common in Ohio, in fact the only record of its being taken in the state, so far as I am aware, is a specimen in the University collection captured in Medina County August 9, 1897. Specimens have been taken in Kentucky, just opposite Cincinnati. The specimen taken in Medina County was a much rubbed one, and probably flew there from farther south. The larva of the species feeds on violets.

4. *Argynnis idalia*, Drury. Blatchley, 377; Fernald, 36; French, 150; Morris, 41; Harris, 285, fig. 110.

Speyeria idalia, Scudder, 80.

The regal fritillary, the idalia butterfly, has been reported from all sections of the state, but seems to be most common in northern Ohio. A fine male specimen taken at Napoleon bears the date of July 7, 1896. Many others were seen in the same place on the same date. The larva feeds on violets.

5. *Argynnis cybele*, Fab. Blatchley, 377; Edwards, I, 67, pl. 21; French, 155; Morris, 42; Scudder, 79; Fernald, 38.

The great spangled fritillary, or the cybele butterfly, is one of our most common species all over the state. It may be seen on the wing from spring to early fall. The larvæ feed on violets and other low growing vegetation.

6. *Argynnis alcestris*, Edw. Blatchley, 378; French, 158; Scudder, 78.

This species appears to be distributed over a large part of northern Ohio. It is on the wing during July and August. The species is separated from cybele by the absence of fulvous between the outer two rows of silver spots on the under side of the hing wing. In some specimens there may be a trace of fulvous, while cybele has this whole space fulvous.

7. *Argynnis atlantis*, Edw. Blatchley, 379; Edwards, I, 75, pl. 24; Fernald, 40; French, 160; Scudder, 76.

The mountain silver-spot fritillary is reported from Ohio by Webster on the strength of a specimen taken in Franklin County in June, 1891.

8. *Argynnis bellona*, Fab. Blatchley, 379; Fernald, 41; French, 164; Harris, 287; Morris, 45.

Brenthis bellona, Scudder, 72.

The meadow fritillary is a common Ohio species. It flies during July and August. Low meadows seem to attract it. The larva feeds on violets. This is the only argynnid of the state that lacks the silver spots on the under side of hind wings.

9. *Argynnis myrina*, Cram. Blatchley, 379; Fernald, 40; French, 161; Harris, 286; Morris, 45.

Brenthis myrina, Scudder, 74.

The silver-bordered fritillary is more common than the previous one in northern Ohio. It is about the size of *bellona* but may be separated from that species by the presence of silver spots on the under side of the hind wings.

10. *Melitæa harrisii*, Scud. French, 170.
Phyciodes harisii, Fernald, 45.
Cinclidia harrisii, Scudder, 68.

Harris' butterfly was taken in the vicinity of Cincinnati, by Dr. Dury.

11. *Phyciodes nycteis*, Doubl-Hew. Blatchley, 381; French, 172; Fernald, 46.

Melitæa nycteis, Morris, 325, 351.

Charidryas nycteis, Scudder, 69.

The silver crescent is a lover of low ground and is usually seen around flowers that grow near the mouth of springs. The larvæ feed largely upon wild asters.

12. *Phyciodes tharos*, Drury. Blatchley, 381; Edwards, II, 161; Fernald, 47; French, 177; Scudder, 71.

Melitæa tharos, Morris, 51.

Melitæa pharos, Harris, 289.

This species exists in two distinct forms, the winter form *marcia*, and the summer form *morpheus*. Both of these are common in all parts of the state. *Morpheus* is extremely abundant in the latter part of September and often flies until the first of October at Columbus. They congregate around small puddles of water or muddy places in company with the common yellow butterfly. The food plant of the larvæ is asters.

13. *Phyciodes batesii*, Reak. French, 180.

This species is reported for Ohio in Edwards' Catalogue of the Diurnal Lepidoptera of America north of Mexico.

14. *Grapta interrogationis*, Fabr. Blatchley, 381; Edwards, I, 111; Fernald, 49; French, 182; Morris, 53.

Vanessa interrogationis, Harris, 298.

Polygonia interrogationis, Scudder, 97.

The semicolon butterfly, or the violet-tip, is common all over Ohio. The species is dimorphic and exists in the two forms *fabricii* and *umbrosa*. The former is common in the later part of summer while the latter is most often seen in early spring. The larvæ of this species oftentimes appears on the elm in great numbers and at such times does serious injury to the foliage of these trees. Nettle, hop and other related plants furnish food for the species.

15. *Grapta comma*, Harr. Blatchley, 382; Edwards, I, 101; Fernald, 50; French, 185; Morris, 54.

Vanessa comma, Harris, 300.

Polygonia comma, Scudder, 95.

Grapta dryas, Edwards, I, 109.

The hop merchant has received a suspicious name on account of its occasional feeding upon the hop plant. So far as I have observed, the larvæ are most often found on nettles and oftentimes on elm. I have seen them on hops early in the season. Like the last named species, this one is dimorphic and exists as a winter form *dryas*, and a summer form *harrisii*. Shady ravines are excellent places to find this species on the wing. Numbers of them may be seen resting on the trunk of the common yellow locust, seemingly for the purpose of feeding upon the sap that exudes from wounds made by the long-horned beetle that does so much damage to this tree.

16. *Grapta faunus*, Edw. Edwards, 99; Fernald, 52; French, 187.

Polygonia faunus, Scudder, 94.

This species seems to be local in its distribution. It is reported from Cincinnati and vicinity in this state, and has a range including a great part of northern United States. Gooseberry and currant are among its food plants.

17. *Grapta progne*, Cram. Blatchley, 383; French, 190; Fernald, 53.

Vanessa progne, Harris, 301; Morris, 56.

Polygonia progne, Scudder, 93.

The progne butterfly, although not abundant, may be found in any part of Ohio. The larvæ are known to feed upon currant and gooseberry. Specimens in the University collection were taken at Napoleon, July 7, 1896.

18. *Grapta j-album*, Bd.-Lec. Blatchley, 383; Fernald, 54; French, 192.

Vanessa j-album, Harris, 298; Morris, 56.

Eugonia j-album, Scudder, 92.

The white J butterfly is the most beautiful member of the genus. It is not a common Ohio species by any means, but seems to occur occasionally in all sections of the state. The larvæ have been found feeding in companies on white birch.

19. *Vanessa antiopa*, Linn. Blatchley, 383; Fernald, 55; French, 193; Harris, 296; Morris, 57.

Euvanessa antiopa, Scudder, 90.

The mourning cloak or the antiopa butterfly is one of the earliest to appear in spring, and one of the commonest during a large part of the summer. The larvæ may be found feeding upon the leaves of willow and poplar.

20. *Vanessa milbertii*, Godt. Blatchley, 384; Fernald, 56; French, 195; Harris, 302; Morris, 56.

Aglais milbertii, Scudder, 89.

The American tortoise-shell is notable for its appearance on the wing early in the season. It is a northern form and has not been taken south of Oberlin. The species seems to be partial to open spots in grounds where trees are growing, and often frequents roadsides and sunny hillsides. The larvæ feed on nettle.

21. *Pyrameis atalanta*, Doub. Blatchley, 384; Fernald, 57; French, 199; Morris, 59.

Cynthia atalanta, Harris, 294.

Vanessa atalanta, Scudder, 87.

The red admiral is an abundant butterfly in all parts of Ohio, making its appearance with the first warm day of spring and remaining on the wing until late in the fall. It is an introduced species, being found also in Europe. Its larva feeds on nettle.

22. *Pyrameis huntera*, Fabr. Blatchley, 385; Fernald, 58; French, 198; Morris, 60.

Cynthia huntera, Harris, 292.

Vanessa huntera, Scudder, 85.

The painted beauty is a common form whose larva feeds upon everlasting. The adult is most often seen in the after part of the season in fields where flowers are abundant.

23. *Pyrameis cardui*, Linn. Blatchley, 385; Fernald, 59; French, 199; Morris, 59.

Cynthia cardui, Harris, 291.

Vanessa cardui, Scudder, 84.

The thistle butterfly, or painted lady, is found throughout the state and is interesting on account of its remaining on the wing so late in the season. It is not uncommon to see specimens of this butterfly the last of November in the latitude of Columbus.

24. *Junonia cœnia*, Hub. Blatchley, 386; Fernald, 60; French, 200; Morris, 61; Scudder, 82.

Cynthia lavinia, Harris, 293.

The buckeye or cœnia butterfly has been taken at Columbus in September and October. The larva have been taken on plantain.

25. *Limenitis ursula*, Fabr. Blatchley, 386; French, 206.

Nymphalis ursula, Morris, 64.

Nymphalis ephestion, Harris, 283.

Basilarchia astyanax, Scudder, 101.

The ursula butterfly is a common form in central Ohio and is also reported from various sections of the state.

26. *Limenitis arthemis*, Dru. Blatchley, 386; Edwards, II; Fernald, 60; French, 208.

Nymphalis arthemis, Harris, 283; Morris, 65.

Basilarchia arthemis, Scudder, 98.

Limenitis proserpina, Edwards, I, 127.

This species has been taken at Oberlin and probably may be taken anywhere in northern Ohio. It is commonly called the banded purple.

27. *Limenitis dissipus*, Gdt. Blatchley, 387; Edwards, II, 227; Fernald, 63; French, 210.

Nymphalis dissipus, Harris, 281; Morris, 65.

Basilarchia archippus, Scudder, 102.

The viceroy is common all over Ohio. The larvæ feed on willow.

28. *Apatura celtis*, Bd.-Lec. Blatchley, 388; Edwards, II, 231; French, 215; Morris, 68.

Chlorippe celtis, Scudder, 106.

The eyed emperor is taken commonly at Columbus and in many other places in the state. Columbus specimens have been procured in July and August.

29. *Apatura clyton*, Bd.-Lec. Blatchley, 388; Edwards, II, 245; French, 218; Morris, 68.

Chlorippe clyton, Scudder, 105.

The tawny emperor has been taken sparingly in the state. The larvæ of both this and the last named species feed upon the foliage of hackberry. Of the two forms of clyton, *ocellata* is the commoner.

30. *Debis portlandia*, Fabr. Blatchley, 389; French, 229; Morris, 79; Fernald, 70.

Enodia portlandia, Scudder, 109.

The woodland butterfly has been taken sparingly in central and southern Ohio. The species is on the wing in June and July, generally in thick woods, but Dr. Dury of Cincinnati reports taking a specimen "on a loaf of hot yeast bread that was set out to cool on a window sill." The larva feeds on grasses.

31. *Neonympha canthu*, Bd.-Lec. Blatchley, 390; Fernald, 68; French, 232; Morris, 74.

Hipparchia boisduvalli, Harris, 305.

Satyrodes eurydice, Scudder, 108.

The eyed brown is a common butterfly at Sandusky in July. It has also been taken at Cincinnati and Akron. They usually fly along streams in thickly wooded grounds.

32. *Neonympha eurytris*, Fab. Blatchley, 390; Fernald, 66; French, 238; Morris, 73.

Hipparchia eurytris, Harris, 306.

Cissia eurytus, Scudder, 107.

The wood nymph is a very common butterfly, from early spring till late in the summer, in all parts of Ohio. The banks of streams in the edge of woodlands are usually frequented by this species. It flies close to the ground with a jerky movement, and is quite easily taken. The larvæ of the last two species feed upon grass.

33. *Satyrus alope*, Fabr. Blatchley, 390; Edwards, II, 261; Fernald, 72; French, 243; Morris, 76.

Hipparchia alope, Harris, 305.

Erebia nephele, Morris, 76.

Cercyonis nephele, Scudder, 111.

Cercyonis alope, Scudder, 110.

This is a variable species and a great many varieties and forms have been described. The form *nephele* of Kirby is the only one so far taken in Ohio. Specimens in the University collection were taken at Sugar Grove July 9, 1891.

34. *Libythea bachmani*, Kirtl. Blatchley, 391; Edwards, II, 289; French, 250; Morris, 63.

This particular species has been taken in all sections of the state. It is usually rare, but a few times I have seen it very common. In 1896 it was abundant in central and northern Ohio in June and July. The larva feeds on hackberry.

LYCÆNIDÆ.

Belonging to the family *Lycænidæ* are 13 Ohio species. These are medium to small sized species, with coppery, brown, black or blue colors, and many of them with the hind wings tailed. The members of this family have been neglected in Ohio, and the collector who pays special attention to them will be sure to add several species to the list given below.

35. *Calephelis borealis*, G. & R. French, 253.

Taken at Georgesville June 23, 1895.

36. *Thecla halesus*, Cram. Blatchley, 392; French, 255; Morris, 91.

Has been taken at Cincinnati.

37. *Thecla m-album*, Bd.-Lec. Blatchley, 392; French, 256; Morris, 92.

38. *Thecla humuli*, Harr. Blatchley, 392; Fernald, 76; French, 259; Harris, 276.

Uranotes melinus, Scudder, 117.

39. *Thecla edwardsii*, Saund. French, 261; Scudder, 121; Blatchley, 393.

40. *Thecla calanus*, Hbn. Blatchley, 393; Fernald, 78; French, 263; Scudder, 120.

41. *Thecla strigosa*, Harr. Blatchley, 393; Edwards, I, 146; Fernald, 77; French, 266; Harris, 276; Morris, 101.

Thecla liparops, Scudder, 119.

42. *Thecla titus*, Fabr. Blatchley, 394; Fernald, 84; French, 278.

Thecla mopsus, Harris, 278; Morris, 102.

Strymon titus, Scudder, 113.

43. *Feniseca tarquineus*, Fabr. Blatchley, 395; Fernald, 85; French, 279; Scudder, 130.

44. *Chrysophanus thoe*, Bd.-Lec. Blatchley, 395; French, 281; Scudder, 127.

45. *Chrysophanus expixanthe*, Bd.-Lec. Blatchley, 395; Fernald, 86; French, 282.

Epidemia epixanthe, Scudder, 128.

Lycæna epixanthe, Harris, 274.

Polyommatus epixanthe, Morris, 85.

46. *Lycæna lygdamus*, Doubl. French, 284; Edwards, I, 150.

This species has been taken at Cincinnati.

47. *Lycæna pseudargiolus*, Bd.-Lec. Blatchley, 396; Edwards, I, 153; II, 315; Fernald, 88; French, 78.

Polyommatus pseudargiolus, Harris, 274.

Argus pseudargiolus, Morris, 82.

Cyaniris pseudargiolus, Scudder, 125.

The azure blue butterfly is an extremely variable species. Several forms and varieties have been recognized. Besides the true *pseudargiolus*, *violacea* and *neglecta* have been taken in the state. The latter may be seen flying as early as the 10th of April in central Ohio. Sparsely wooded grounds in the vicinity of water or marshes are a favorite haunt for the various forms of this species.

48. *Lycæna comyntas*, Gdt. Blatchley, 397; Fernald, 91; French, 292.

Polyommatus comyntas, Harris, 275; Morris, 83.

Everes comyntas, Scudder, 123.

The tailed blue may be separated from other Ohio species of the genus by the presence of a slender tail on the outer border of each of the hind wings. It is a common species all over the state and flies most commonly between June 1st and September 15th.

PAPILIONIDÆ.

To this family belongs 17 Ohio species and numerous subspecies. The forms are from medium to large in size, with hind wings sometimes tailed. In colors, white, black and various shades of yellow usually predominate, but various other colors are often present. Among the food plants of the different species, are clover, cabbage and various kinds of shade and ornamental trees and shrubs.

49. *Pieris protodice*, Bd.-Lec. Blatchley, 370; French, 107; Morris, 317.

Pontia protodice, Scudder, 141.

The southern cabbage butterfly exists in the state in two forms, namely: the typical *protodice* and its variety *vernalis*. The latter occurs most commonly in early spring.

50. *Pieris rapæ*, Lin. Blatchley, 371; Fernald, 27; French, 114; Scudder, 144.

The imported cabbage butterfly is well known from the immense injuries which the larvæ inflict upon cabbage. It is the most abundant species of butterfly in the Ohio fauna.

51. *Pieris virginiensis*, Edw. French, 113.

One specimen in the University collection, taken at Columbus in the spring of '91, has the characters of this species.

52. *Anthocaris genutia*, Fab. Blatchley, 372; Edwards, II, 83; French, 118; Morris, 20; Scudder, 140.

The falcate orange tip has been taken in various places in Ohio. March 20, '95, and May 2, '91, are dates borne by specimens in the University collection.

53. *Catopsilia eubule*, Linn.

Callidryas eubule, Blatchley, 373; French, 119; Morris, 25; Scudder, 132.

The cloudless sulphur has been taken in the southern part of the state.

54. *Catopsilia philea*, Linn.

Callidryas philea, Blatchley, 373; French, 124; Morris, 25.

A single specimen taken in Franklin County, bears the date of September 16, 1895.

55. *Meganastoma cæsonia*, Stoll.

Colias cæsonia, Blatchley, 373; French, 127; Morris, 27.

Zerene cæsonia, Scudder, 133.

During the spring of '95, several specimens of the dog's head butterfly were taken at Columbus, flying over a clover field. Its larvæ feed on clover.

56. *Colias eurytheme*, Bdv. Blatchley, 374; Edwards, I, 45; II, 103; French, 128.

Colias keewaydin, Edward, I, 49.

Eurymus eurytheme, Scudder, 135.

The orange sulphur is not a common butterfly in Ohio, but has been taken at Sandusky, Akron and Cincinnati. Both the typical *eurytheme* and the form *keewaydin* belong to our fauna.

57. *Colias philodice*, Gdt. Blatchley, 374; Edwards, II, 93; Fernald, 30; French, 133; Harris, 272; Morris, 29.

Eurymus philodice, Scudder, 134.

The clouded sulphur was the most common of Ohio butterflies last season. It was not uncommon to see from 20 to 50 specimens around a single muddy spot in the road or barnyard. Besides the typical species the forms *anthyale* and *albinic* are often taken.

58. *Terias nicippe*, Cram. Blatchley, 375; French, 136; Morris, 33.

Xanthidia nicippe, Scudder, 137.

The black bordered yellow is found in all parts of the state. It is very common in central Ohio in early spring. The larvæ feed on cassia.

59. *Terias lisa*, Bd.-Lec. Blatchley, 375; Fernald, 32; French, 139; Morris, 34.

Eureme lisa, Scudder, 138.

The little sulphur is a common form in southern Ohio, if I may judge from observations taken at Portsmouth last fall. The species was on the wing in numbers September 9 and 10. Specimens from Napoleon, Columbus and Sandusky are in the University collection also. The larvæ feed on clover and cassia.

60. *Papilio ajax*, Linn. Blatchley, 367; Edwards, I; French, 84; Morris, 351.

Iphiclides ajax, Scudder, 146.

The zebra swallow-tail may be seen in Ohio from early spring till late in the fall. Besides the true *ajax* the forms *walshii*, *telamonides* and *marcellus* are common. The larvæ of all the forms feed upon pawpaw.

61. *Papilio turnus*, Linn. Blatchley, 369; Edwards, II, 7; Fernald, 23; French, 97; Harris, 268; Morris, 2.

Jasomades glaucus, Scudder, 148.

Papilio glaucus, Morris, 2.

The tiger swallow-tail is one of our largest and prettiest butterflies. Specimens are often seen flying in apple orchards soon after the leaves have appeared in spring. They are often observed also in the vicinity of streams and standing water. The larvæ feed upon various rosaceous and other plants. There is a black form, *glaucus*, of this species. Specimens of this form are always females.

62. *Papilio thoas*. Linn. Var. *cresphontes*, Cram. Blatchley, 370; French, 101.

Heraclides cresphontes, Scudder, 151.

The giant swallow-tail is said to be rare in Indiana, but I can hardly say the same of Ohio. It has been taken in all parts of the state. The larvæ have been taken frequently on hop tree at Columbus and Wauseon.

63. *Papilio asterias*, Fabr. Blatchley, 368; Fernald, 21; French, 89; Harris, 265; Morris, 5.

Papilio polyxenes, Scudder, 153.

The celery butterfly is a common one in our state where its larvæ do some damage by feeding upon celery and other umbelliferous plants.

64. *Papilio troilus*, Linn. Blatchley, 369; French, 93; Harris, 266; Morris, 5.

Euphœades troilus, Scudder, 150.

The larvæ of this species are commonly found upon sassafras.

65. *Papilio philenor*, Linn. Blatchley, 368; French, 86; Morris, 6.

Lærtias philenor, Scudder, 145.

So far as I have observed, this is the rarest *Papilio* we have in the state. Specimens in the University collection bear the date of July 6, '91.

HESPERIDÆ.

To this family belongs at least one-fourth of the species of butterflies found in Ohio. Many of these forms are difficult to separate, and all are tedious to stretch and prepare for the collection. Many of the larvæ have never been recognized, consequently there is room in the group for plenty of original investigation. Most of the species of larvæ studied are known to feed upon grass. The collector of Ohio butterflies will be sure to add many species to this list if he pays special attention to the members of this group. I have not collected or observed sufficiently these forms to allow an attempt at giving notes on each species, so shall simply give a list, and hope at some future time to be able to treat the subject more fully.

66. *Ancyloxypha numitor*, Fabr.
67. *Pamphila zabulon*, Bd.-Lec.
68. *Pamphila hobomok*, Harr.
    a. pocohontas, Scud.
69. *Pamphila sassacus*, Harr.
70. *Pamphila uncus*, Edw.
71. *Pamphila leonardus*, Harr.
72. *Pamphila campestris*, Bdv.
    a. huron, Edw.
73. *Pamphila phylæus*, Dru.
74. *Pamphila otho*, S. & A.
    a. egeremet, Scud.
75. *Pamphila peckius*, Kirby.
76. *Pamphila mystic*, Scud.
77. *Pamphila cernes*, Edw.
78. *Pamphila manataaqua*, Scud.
79. *Pamphila verna*, Edw.
80. *Pamphila metacomet*, Harr.
81. *Pamphila bimacula*, G. & R.
82. *Pamphila pontiac*, Edw.
83. *Pamphila dion*, Edw.
84. *Pamphila delaware*, Edw.
85. *Amblyscirtes vialis*, Edw.
86. *Pyrgus tessellata*, Scud.
87. *Nisoniades brizo*, Bd.-Lec.
88. *Nisoniades persius*, Scud.
89. *Nisoniades juvenalis*, Fabr.
90. *Philosora catullus*, Fabr.
91. *Eudamus pylades*, Scud.
92. *Eudamus bathyllus*, S. & A.
93. *Eudamus tityrus*, Fabr.